ELECTRICAL REVIEW
AND
WESTERN ELECTRICIAN

VOL. LVI, No. 11. CHICAGO, SATURDAY, MARCH 12, 1910. ISSUED WEEKLY.

BY THE
ELECTRICAL REVIEW PUBLISHING COMPANY
CHARLES W. PRICE, President and Treasurer.
A. A. GRAY, General Manager. H. S. TUTHILL, Secretary.
C. W. FORBRICH, Assistant Treasurer.

PUBLICATION OFFICE: MARQUETTE BUILDING, CHICAGO

EASTERN DEPARTMENT . . . . . 13 Park Row, New York.
E. E. Wood.
EUROPEAN OFFICE . . . . . 42 Old Broad Street, London, E. C.
Henry W. Hall.

Editors:
CHARLES W. PRICE. A. A. GRAY. F. H. BERNHARD.
Associate Editors:
H. FARRINGTON. H. EHRLICH. C. H. SEAVER.

SUBSCRIPTIONS.

One Year, United States	$3.00
One Year, Canada	4.00
One Year, Foreign Countries	6.00
Single Copy, 10 cents. Back numbers, beyond one month, each	.25

Entered as second-class matter, November 7, 1908, at the Post Office at Chicago, Ill., under the Act of March 3, 1879.

CONTENTS.

EDITORIALS:
The Value of Unit Costs in Electrical Operation 513
The Gasoline-Electric Generating Set on the Farm 514
The Business Outlook 515
Friction and Lubrication 515
Postal Night Letter Telegrams 516
Explains Telephone Deal 516
General Electric Business 516
Ferdinand W. Roebling 517
Metropolitan Receiver's Request 517
$26,000,000 for Third Avenue Line 518
Elmer W. Gillmer 518
The Feather River Hydroelectric Development 519
Catalogue Experience Meeting of the Technical Publicity Association. 522
Cleveland Rates for Three Cents 522
Railway Sale Affirmed 522
Electrical Notes for Great Britain 523
New Engineering Electric Light Association Convention 525
The National Electric Light Association Convention 525
Industrial Exposition at Detroit 526
Engineering Building for North Carolina College 527
CENTRAL STATION PRACTICE:
Boiler Explosions 528
Central Stations versus Isolated Plants for Textile Mills 529
Niagara Falls Power Company Bond Issue 532
ELECTRIC LIGHTING AND ILLUMINATING ENGINEERING:
Successful Tungsten Factory Lighting 533
Syracuse Makes Extensive Additions to Electric Lighting 533
Tungsten Economy in the Lighting of Office Buildings 535
Proposed Street Lighting for Wichita, Kansas 536
Lighting Scheme for Galesburg, Ill 536
TELEPHONY, TELEGRAPHY AND WIRELESS:
A Talk on Rural Lines 538
Newspaper Technics 539
Train Dispatching by Telephone 539
Dispatching Trains by Telephone on the Boston and Maine Railroad 541
Chicago Electric Club 541
INDUSTRIAL POWER:
An Electrically Operated Saw Mill 542
Electrically Driven Pumps—X 545
Electric Motors in Breweries 545
New Movable Coil Galvanometer 546
A Self Contained Electric Pump 546
ADVERTISING AND SELLING:
High Efficiency Lamps and Central Station Advertising 547
Constructive Publicity 549
Window Lighting Campaign 549
FINANCIAL NOTES 550
AMONG THE CONTRACTORS AND SUPPLY MEN 551
INDUSTRIAL SECTION:
The Central Station Development Company 552
No Discrimination Against Electric Lines 552
Electric Lighting System for Automobiles 553
Bell Ringing Transformer 553
The Guaranteed Electric Iron 554
New Shock Absorber for Tungsten Lamps 554
Drop-out Span Protector 554
ELECTRIC FANS FOR 1910 555
CURRENT ELECTRICAL NEWS 563
RECORD OF ELECTRICAL PATENTS 574

Copyright, 1910, by the Electrical Review Publishing Company.

THE VALUE OF UNIT COSTS IN ELECTRICAL OPERATION.

Observation of statistical practice in the central station and electric railway fields discloses wide variations among operating companies in regard to records and calculations based upon unit figures. It ought not to be necessary at this late day to advocate the keeping of accounts and measurements that will enable even the smaller companies to analyze their operations on a basis that can be easily grasped by the mind of the person interested in comparing one organization with another. Yet it is not today the case that every electric power plant disports a recording wattmeter installation that enables the owner to figure the cost of his total output per unit. It is not more than four or five years since one could find central stations unable to state their total yearly or monthly kilowatt-hour output at the generating plant, in spite of the existence of the best type of regulation by a State Commission. Fortunately such practice as that is ashamed to show its face among intelligent operating methods today, although not a few isolated plants are still without the means of determining their electrical outputs in given periods.

What is the real benefit of figuring costs and other operating data upon the unit basis? Are not the total results of a month's run sufficient, or the total cost of a given policy in equipment development or station expansion enough to know? Of what use is it, in the small company, especially, to spend time massing statistics of per capita earnings, operating costs per kilowatt-hour generated or sold, distribution expense per unit or per mile of line? To some managers questions of this kind are so unnecessary as to warrant an apology for their publication, but to others they represent an expressed conviction and a "willingness to be shown" what is the advantage of going into operating matters, construction costs and even estimates, on the basis of the kilowatt, the pound of coal, the car-mile or the tributary unit of population.

The principal reason for taking out the slide rule in the face of public utility statistical data is the certain fact that total figures are not easily realized. We cannot do without them, but after all it is the small figures which permit analysis and interpretation. Just as the lawyer establishes a receptive attitude toward his line of argu-

ment by a cross-examination consisting of perhaps hundreds of readily comprehended questions, so does the central station or traction manager catch the drift of the operating tendencies of his company through the plain and simple relations deduced by unit figures. It is all very interesting to know that a plant generated 5,750,000 kilowatt-hours last year at a cost of $72,200; and that its neighbor produced 3,700,000 at an expense of $42,800; but the vital feature of any comprehensive study of the two stations is that the larger company spent 1.24 cents and the smaller one 1.15 cents per unit of energy delivered at its bus bars. Even an eye skilled in rapid comparisons could not appreciate the total difference in the above case as quickly as the unit difference. And if one followed out the line of inquiry to its logical conclusion here, he would be interested to know that the cost of coal per ton was $4.59 in the larger plant and $3.97 in the smaller station, rather than the total fuel cost in each case.

By the use of unit figures time is saved in calculations, unsuspected relations between phenomena are often discovered, loose ends of operation caught up, and a closer appreciation is gained of the actual physical existence of invisible forces and their costs in application. In a station where the costs per kilowatt-hour are carefully determined and filed each week or month, the fidelity with which the figures year after year indicate the definiteness of the energy unit is most suggestive to the manager who is interested in keeping down his expenses in proportion to his output. If one month shows a notable change in the unit cost he can at once take steps to run the cause to earth; whereas, if only the totals are kept there might be a relatively small gain in output and a larger gain in total expense, which would not at once indicate that the operating efficiency was declining. The extent to which the sense of proportion is developed is in large degree a measure of one's command of a complex situation, and in the daily wear and tear of electrical production the value of reducing results to the unit basis in order to secure this idea of relative conditions and results is almost beyond exaggeration.

Despite all the mistakes made in comparing operating results under diverse conditions without due appreciation of those differences, no executive can properly contrast his work with his neighbor's without cutting clear from the fogs and illusions of total figures. Neither can he approach bids for new equipment, tenders for construction work, or other propositions involving expenditures of moment with the keenest insight as to whether he is offered his money's worth unless he strips off the covering of an impressive total price and opens to view what the charge is per unit selected. Outside the electrical field and among the laymen who pay the bills for service the total cost of commodities is usually of more interest than the unit expense. But the layman does not operate the property, although he often thinks he could do so with little or no technical training or experience. Little by little in America the scientific administration of even the smaller public utility companies is taking the place of the rough-and-ready policies which were perhaps necessary before the days of accurate measurement and acute observation of adequate accounting statistics. And the beauty of unit figures is the light which even the simplest divisions throw upon modern operating problems.

THE GASOLINE-ELECTRIC GENERATING SET ON THE FARM.

In many cases the installation of isolated plants is not advisable, when electric current from even a distant central station is available. In some factories, however, where by the use of the exhaust steam in manufacturing processes the actual power cost per kilowatt-hour at the switchboard may be materially reduced, an isolated steam-driven plant will prove to be more economical than central-station service. The paper by Mr. Charles T. Main, which is abstracted in the Central Station section of this issue shows some instances of this. There is another field, however, where the isolated plant will prove to be extremely advantageous, and that is on farms so remotely situated that the expenses incidental to electrical transmission from the nearest central station are so high that the cost of such service is practically prohibitive.

For remote farms the gasoline-electric generating set has many excellent points in its favor. Its first cost is comparatively low; the gasoline engine is extremely reliable, costs little to run, needs practically no attention, and usually occasions little or no trouble for repairs. The whole apparatus occupies but little room, and there are no troublesome boilers and furnaces to keep in operation and repair.

The advantages of electric service on the up-to-date farm are so many and various that a farmer who has become accustomed to the uses of electricity will wonder however he managed to get along before without it. It must be remembered that the vast majority of farms have hitherto had to rely on oil and candles for illumination purposes. With the gasoline-electric generating set and the use of tungsten or other high-efficiency lighting units, the cost of lighting is not materially increased, the standard of illumination is greatly improved, and the convenience and cleanliness of the electric light are so far ahead of those of the older methods that there is indeed no comparison on these scores, and this not to mention the sanitary aspect of the comparison in the dairies and other departments where nonvitiation of the air is of the highest importance.

For driving the multifarious machines on the farm, as threshers, feed cutters, grindstones, laundry machinery, cream separators, horse groomers and clippers, pumps, refrigerators, fans, vacuum cleaners, etc., the electric motor is

unrivaled. By the use of a simply erected and inexpensive transmission line to the fields, plowing, reaping, mowing and similar operations may be performed with the greatest ease and at extremely small cost. In the house itself, too, the use of electricity will be apparent for the operation of electric irons, heating and cooking utensils, auxiliary radiators, etc.,—in fact, there is hardly a thing requiring work which cannot better be done by electricity than without it. The conveniences of the town are thus largely brought into the country. The farmer can employ an electric car for transportation purposes in and around his estate, or, if a river or lake is close at hand, he may acquire an electric launch, the batteries of which he can charge from his own switchboard.

There is another advantage of the gasoline-electric set which must not be overlooked. Many farms and country estates have a hot-water heating system for the house, greenhouses, and the various other buildings. This can be replaced, or at least supplemented, by a system utilizing the waste heat from the water-cooling apparatus of the gasoline engine and also from the hot gases of the exhaust. The most up-to-date manufacturers of gasoline-electric generating sets have provided for such a contingency by designing a heating system operated by these means, and by the use of this a considerable economy may thereby be effected.

THE BUSINESS OUTLOOK.

With the coming of open weather a great deal of construction that has perforce been held in abeyance during the severe winter we have been passing through will be well under way. Not only new developments, but investment construction upon the part of well-established concerns will be the order of the day, and it looks like a prosperous season for the laborer, the builder and contractor, the designer and manufacturer alike. The misapprehension that bewildered many corporations respecting the effects of the corporation inquiry and taxation, and the possible tendency of legislation in this direction, has apparently been dispelled, and it is likely that every projected undertaking will be financed without difficulty.

In this connection, however, it is well to point out that it does not take a very great pressure to unbalance a situation poised as delicately as is the question of whether it is desirable or not to invest good money in public utilities. There are thousands of investors who have found that it is, and thousands who have lost heavily. With a better understanding, however, of the cost of service upon the part of the public, and a keener appreciation of public good will upon the past of the corporation, much is being gained in the conserving of the peace and comfort of the public and of the investment of those supporting the corporation. The present indication is that these are the lines along which progress can and will be made.

FRICTION AND LUBRICATION.

While friction is necessary for the action of almost all machinery it is also extremely detrimental in nearly all cases of rubbing contact by reason of the losses it occasions in the transmission of power. Thus in the case of a belt driving a pulley, friction is indispensable, whereas in bearings it is the cause of loss of power. In the mechanical drive of machine shops and factories by line shafting, countershafts, gearing, belting, etc., friction may consume considerably more than half of the brake horsepower of the driving prime mover. This is where the electric motor, especially when used for individual drive, proves of the greatest individual drive, proves of the greatest benefit in materially reducing the friction losses.

When two pieces of metal or other solid substances rub together, excessive friction results. This is greatly minimized by the employment of a suitable lubricant, differing in properties according to the particular exigencies of the case in question, between the rubbing surfaces. This lubricant forms a thin film between the surfaces and thus converts the so-called solid friction into liquid friction with a consequent reduction of the power losses.

The various kinds of lubricants which are most applicable for particular purposes are well known, and information on these points can easily be obtained from the textbooks and from the manufacturer's catalogues. What is not so generally known, however, is the proper treatment of lubricants with a view to their most efficient use and conservation.

Perhaps one of the principal difficulties encountered in the use of lubricating oils in crank chambers, steam turbines, etc., is what may be called the emulsification of the oil which is due to admixture of water and suspended impurities. Mr. James E. Southcombe, writing in a recent issue of *The Electrical Review*, of London, Eng., calls attention to this trouble, in which he points out that the formation of the emulsion is due to microscopic particles of water being suspended in the oil. When the amount of this water does not exceed, say, three per cent, the lubricating properties of the oil are not injured to any appreciable degree, but when the water attains in amount to from seven to ten per cent of the mixture, lubrication becomes inefficient. There seems always to be present ultramicroscopic particles of iron, which, by an intercharge of chemical action between the waters and the air which is present, oxidize the oil to a certain extent, hasten the formation of an emulsion, and thus destroy the lubrication. The proposed remedy is to prevent, as far as possible, the leakage of water from the cooling coil in the oil chamber in the case of a turbine, or priming from the boiler in other forms of engine. Another partial preventive is to use water which does not contain suspended or dissolved matter which tends to promote emulsification of the oil. By these means the life of the oil will be materially increased.

Postal Night Letter Telegrams.

The Postal Telegraph-Cable Company announced last Sunday that, beginning the following day, it would render night letter service between all offices on its own telegraph lines and the lines of its direct connections in the United States. Messages of this new class will be known as night letter telegrams. They will be accepted at Postal Telegraph offices over the counter or by telephone in the usual way. The charge for night letter telegrams of fifty words or less will be the regular day rate for ten words, and one-fifth of this rate will be charged for each additional ten words or less. They must be written in plain English. Code or cipher will not be permitted. They will be accepted for transmission at night and delivery at destination on the morning of the next ensuing business day by mail or messenger at the option of the company.

Explains Telephone Deal.

President Theodore N. Vail, of the American Telephone & Telegraph Company, gave out a statement last week in which he said that his company has purchased the 82,000 shares of its own stock recently sold by the Mackay Companies to a syndicate. The stock was acquired at a price representing a cash overturn of between $11,000,000 and $12,000,000.

On the basis of $11,500,000, this figures out a little more than $140 a share, or about $2 less a share than the present market price.

The Mackay Companies was the largest individual stockholder of the American Telephone and Telegraph Company for a number of years.

President Vail's statement in regard to the transaction says:

"This block is not for sale, but was secured with the idea of utilizing it this summer, in exchange for stocks of several subsidary companies being financed and regrouped in accordance with the plan to confine physical property of operating companies to establish state lines.

"There is no basis for assertions that a rate war between Western Union and Postal Telegraph Company is impending. So far as Western Union is concerned, nothing of the kind is thought of, and we have every expectation of continuing the same relations as in recent years. Any contention will be in the way of improvement of service, and we hope to make it interesting for them in these lines.

"The American Telephone Company, through affiliation with Western Union, is planning ultimately to greatly increase the use of the telegraph for business and social purposes. We expect to afford the Postal the same advantage of handling telegraph messages over telephone wires as to Western Union. As Western Union has a larger plant, which reaches more places, it will probably do a somewhat larger business.

"Telegraph rates are as low as commensurate with a fair profit, and there is no expectation of making any radical change in schedules."

Licensing of Master Electricians in New York.

Electricians from all over the state appeared on March 1, at Albany, N. Y., before the Assembly committee on cities in favor of the bill introduced by Assemblyman McGregor, providing for the licensing of master electricians. The chief argument presented was that protection to life and property would result if master electricians were required to pass a state examination for fitness and that such examinations would result in only qualified men being permitted to work in this capacity, to the great benefit of the trade.

James R. Strong, representing the New York Electrical Workers' Association, said that much bad work was being done by poor electrical workmen and that it was such work which caused the majority of the fires due to electricity. He urged that the McGregor bill be passed, declaring that it standardized the efforts of electrical workmen. He said that the principal endeavor of the organization he represented was to license the responsible party.

B. D. Troitel, of New York, representing the Builders' Trades Employers Association, also spoke. He declared the McGregor bill to be a long step in the right direction and if passed would reduce the risk to life and property to the minimum. He reiterated the point that imperfect electrical work caused many fires.

It was stated by J. C. Forsythe, chief inspector of the New York Board of Underwriters, that the bill was aimed at the man who had "an office in his hat" and that there were between 350 and 400 buildings in New York where the electrical equipment was unsafe. He said that some restriction upon the people who were installing electrical wiring was imperative.

A resolution, endorsing the requirement that master electricians be subjected to an examination, was read by James M. Carter, of Buffalo, who represented the Buffalo Builders' Exchange.

Others who favored the project were J. P. Ryan, representing the New York City Electrical Contractors' Association; Frederick Fish, representing the Electrical Contractors' and Builders' Exchange of Rochester, and Edward B. Griffing, of New York.

Receiver for York Haven Water and Power Company.

The York Haven Water and Power Company, of York Haven, Pa., a $3,000,000 corporation, has gone into receivership, Edwin F. Baker, secretary and manager of the company, being appointed receiver. The company's plant is on the Susquehanna River and supplies current for commercial purposes to York, Harrisburg and Steelton. The appointment of a receiver is attributed to the drought of last summer and the suit of the York Haven Paper Company for prior water rights and damages.

Application for a receiver was made by George Poole, of Baltimore, president of the company; Eugene Ivins, of Philadelphia, vice-president, and the Poole Engineering and Machine Company. The company declares that it is unable to meet its obligations falling due this spring. These obligations embrace $140,000 falling due in April, $44,325 coupons on second and third mortgage bonds due in May, and $37,500 on coupons on first mortgage bonds due in June.

General Electric Business.

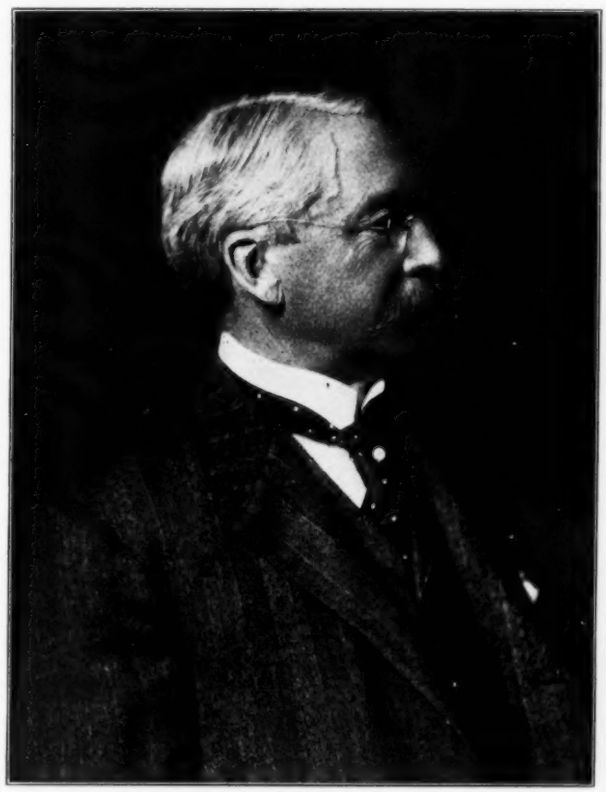
The General Electric Company's business is reported as excellent, with February orders exceeding a $60,000,000 per annum rate and substantially larger than January bookings. The first two months together show a $58,000,000 per annum rate, about ninety-four per cent of the first two months of 1909, but the change of the fiscal year to end December 31, is given as accounting for it, the last month always being a period of largest orders as the books are held open until then.

Ferdinand W. Roebling.

The portrait presented on this page is of Ferdinand William Roebling, the head of the great manufacturing house of John A. Roebling's Sons Company, of Trenton, N. J. Mr. Roebling is one of the four sons of John A. Roebling the founder of the house that bears his full name in its title. The company, whose affairs are so ably administered by Mr. Roebling, is the largest of its kind in the world, its product consisting of iron, steel, copper and brass wire, wire rope, electric cables and modern wire goods. It has been for many years closely connected, either through building entirely or furnishing material for, the great suspension bridges of the United States, the magnificent New York and Brooklyn Bridge, considered the most impressive and beautiful in the world, being a monument to its designer, John A. Roebling, who suggested and developed this, at that time, daring engineering feat.

It has been interestingly stated that Mr. F. W. Roebling could make five railroad trips from the Atlantic to the Pacific, each by a different route, and never lose sight of the product of his industry strung on the poles alongside the railroad tracks over which rolls the commerce of this country.

Mr. Roebling is also an active director in some twenty other important corporations, and is prominent in the social and financial life of his state and city. In addition to being the possessor of an unusually fine library of technical books, Mr. Roebling takes a particularly keen interest in books on ceramics and decorative ware. By nature quiet and unassuming, he possesses many strong qualities, and is a thorough master of every essential detail of his large interests, yet finds time to keep in touch with the commerce of the world through his various established offices in all the foreign capitals. Mr. Roebling may be considered an able representative of the highest class of the American manufacturer, and while possessed of much wealth, is unceasing in his attentions looking to the proper conduct of his various companies. He belongs to the class of productive statesman, and his influence is in favor of thrift, education and right living that go to make the best American citizenship.



FERDINAND W. ROEBLING,
Head of the Great House of John A. Roebling's Sons Company at Trenton, N. J.

Metropolitan Receivers' Request.

Acting upon the suggestion of Judge Lacombe, of the United States Circuit Court, in his order against the Harlem Railroad Company, in the application to have the Madison and Fourth Avenue surface lines of New York city revert back to their ownership, Receivers Joline and Robinson are about to make application to the courts for permission to issue $5,000,000 of receivers' certificates.

This amount will be used in the payment of accumulated special franchise taxes on the Madison, Eighth and Ninth Avenue surface lines, also in the payment of a sum of $400,000 to the Harlem Railroad Company, which amount was paid by that company to prevent the forced sale of the Madison Avenue Railroad Company for taxes due. The amount will also include a sum of $313,900 expended for repairs on the Fourth Avenue line and $505,850 expended on the Eighth and Ninth Avenue lines, making a total of $4,220,000.

Brooklyn Rapid Transit Company Gets Large Rebate.

In the case of the Brooklyn Heights Railroad Company against the Brooklyn City Railroad Company, Referee D. Cady Herrick has found that the plaintiff is entitled to judgment for $1,740,258, with interest from September 1, 1894, being the sum of $1,616,680, making a total of $3,356,959, with costs.

The case has been pending in the courts for seven or eight years. The Brooklyn City Railway Company was leased to the Brooklyn Heights Railroad Company in 1893, and at that time the leased road made an agreement with the Brooklyn Heights road to spend the proceeds of $3,000,000 stock and $3,000,000 bonds in electrifying the road and making improvements.

When the Brooklyn Rapid Transit secured control of the Brooklyn Heights concern in 1896 an investigation was begun to determine how these funds were spent. As a result of the investigation it was alleged by the Brooklyn Rapid Transit that $1,730,000 had not thus been expended, and suit was begun to recover this sum with interest at six per cent since 1894. The case dragged along in several courts and was finally turned over to a referee.

The Brooklyn Rapid Transit now pays for the lease of the Brooklyn City Railway Company an annual rental of $1,200,000, and in order to recover the sum awarded by the referee it may withhold the payment of this rental.

New York Electrical Club Dissolves.

The Electrical Club, of New York city, has decided to wind up its affairs. A committee composed of A. L. Miller, A. S. DeVeau and B. H. Ellis is attending to the closing ceremonies. The club had a membership of nearly 200.

$26,000,000 for Third Avenue Line.

At the County Court House in New York last week the foreclosure sale of the Third Avenue Railroad Company was held. It was known in advance that there would be only one bidder, namely the Reorganization Committee of the holders of $37,560,000 general mortgage bonds of the Third Avenue, issued in 1900.

On behalf of this committee John M. Bowers, its counsel, bid $26,000,000. As there was no opposing bidder Joseph P. Day, the auctioneer, sold the road to Mr. Bowers for his client, James M. Wallace, president of the Central Trust Company, and chairman of the Reorganization Committee.

The road was put up in three parcels; first, the real estate, tracks, roadbed and equipment; second, the stocks and bonds held by the Third Avenue and accompanying corporate rights, and third, the properties named in parcels 1 and 2 as a whole, in case there was a bid in excess of the individual bids for the first two parcels. Mr. Bowers bid $10,000,000 each for parcels 1 and 2 and $26,000,000 for the road, which was declared sold to his client at that figure.

The sale is made subject to the lien of the $5,000,000 first mortgage bonds of the Third Avenue and to various other prior liens recognized by the courts. It has the effect of wiping out the stock of the company so far as any legal standing is concerned, although the bondholders' committee has arranged a certain assessment basis on which the stock may participate in the reorganization.

Water-Cooling Plant for an English Central Station.

In a recent issue of *Electrical Engineering*, of London, Eng., is described a most complete water-cooling plant which has just been erected for the Salford (Eng.) Electricity Works at a total cost of over $60,000. The hot water from the condensers is pumped out of the hot well by four turbine pumps driven by sixty-horsepower direct-current motors into a common pressure main, from which it is distributed to four cooling towers of the natural-draft chimney pattern. In these towers the water is reduced some thirty-five degrees Fahrenheit in temperature, and flows from the tanks below into a common suction tank. The plant has been designed to deal with 750,000 gallons of water per hour, and has several interesting features.

Elmer W. Gillmer.

When the news was flashed across the country of the sudden death, on Saturday, February 19, of Elmer W. Gillmer, of Warren, Ohio, the electrical community received a distinct shock. Mr. Gillmer was a robust and vigorous man, possessed of many dominant characteristics, and to those who were in close association with him twenty-four hours before his death he appeared to be in the best of health. The sudden passing out of the electrical world of a character so vigorous, and a personality so strong, is a blow, the full measure of which cannot yet be estimated.

Mr. Gillmer was born in Warren, Ohio, on March 28, 1862. He was identified with the retail business of the city up to thirty years of age, preparing himself in his dealings with men of every class for the remarkable success which attended the last seventeen years of his life.

ELMER W. GILLMER.

In 1893 he saw with characteristic foresight the opportunity for developing the west side of Warren, and founded in a modest way a factory for the manufacture of incandescent lamps. It was not long before his product was known wherever electric lighting was utilized, and this successful beginning was followed by other manufacturing developments attended with the same degree of enterprise and progress, so that the name of Gillmer soon became a household word in electrical manufacturing and selling circles.

In 1902 the lamp interests of the companies controlled by Mr. Gillmer were affiliated as member companies of the National Electric Lamp Association, and the Peerless Electric Company was incorporated. Mr. Gillmer was the founder also of the Warren Electric and Specialty Company, the Colonial Electric Company, and the Hydroelectric and Gas Company of Warren, Ohio.

Last July Mr. Gillmer succeeded the late J. C. Fish as president of the National Electric Lamp Association. Although busy with the multitude of details connected with the numerous interests to which he was devoted, Mr. Gillmer carried forward his executive duties in connection with the National Electric Lamp Association with remarkable vigor, and initiated many important developments in the improvement of the manufacture of incandescent lamps. He was particularly devoted to securing for the central stations and the user of electric lamps the very best that could be secured for every class of service, and his thorough analysis and understanding of the subject has left a deep impression upon this phase of the electrical industry.

The funeral was held Tuesday afternoon, February 22, being attended by a large delegation of representative men from all parts of the country. His body was placed in the mausoleum which he erected at the time of the death of his second son a few years ago in Oakwood Cemetery. The pallbearers were W. C. Ward, E. E. Nash, J. B. Estabrook, David Estabrook, Robert Bean and George Daugherty. The honorary pallbearers were members of the National Electric Lamp Association, F. S. Terry, B. G. Tremaine, J. Robert Crouse, W. H. Roberts, S. E. Doane, and L. P. Sawyer.

To Run All Cars on Steam Lines.

The operation of the interurban electric cars between Hartford and Rockville, and between Rockville and Melrose, Conn., which run mainly over the steam tracks of the Midland division, equipped with overhead trolley, has been transferred from the Connecticut Company to the New York, New Haven & Hartford Railroad Company. A similar transfer of management has also taken place in the electric cars which run over the Berlin Branch between Berlin and Middletown. The object of these transfers is to keep the operation of all the steam tracks, whether electrically equipped or not, within the direct and immediate control of the steam railroad system.

THE FEATHER RIVER HYDRO-ELECTRIC DEVELOPMENT.

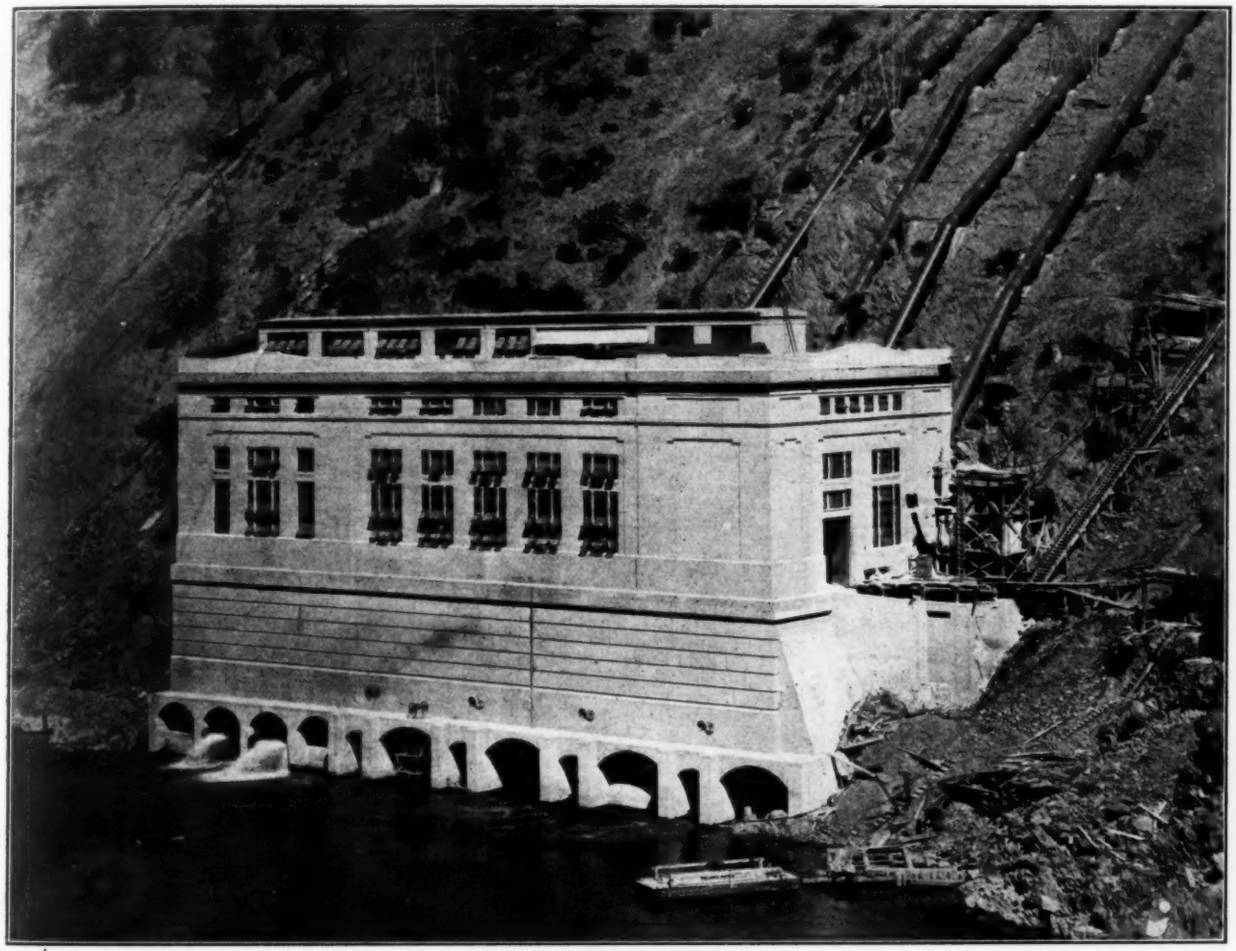
A DESCRIPTION OF A GENERATING AND HIGH-TENSION TRANSMISSION SYSTEM OF EXTRAORDINARY MAGNITUDE.

BY DAY ALLEN WILLEY.

The largest hydroelectric generating center in the West and a system that will furnish more current for power and illumination than any other in the country when completed, is now in operation to such an extent that it is supplying power and light to a group of California communities within a distance of 165 miles from the present generating station. While the project is notable for its size, investment and the dimensions of the mechanism installed, the construction of the power house, conduits and other works has been a conspicuous engineering feat, owing to the site being located in a wilderness with no roads leading to it and much of the work being done in a steep canyon and on a precipitous mountain slope.

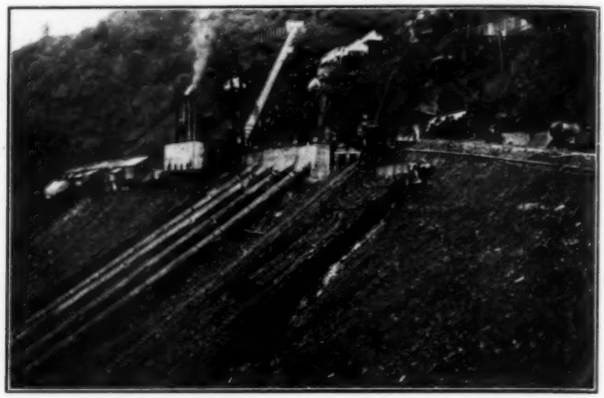
The Feather River in California has been notable for the amount of gold its bed has yielded in placer mining, the metal being washed down with the sediment carried from gold-bearing formation, in the flood season. While this industry has nearly ceased, the location of the upper river and its volume and head of water are such that it was selected by the engineers as the main source of water supply for the electric plants being constructed by the Great Western Power Company, the works in operation being located at what is known as Big Bend, eighteen miles from the city of Oroville and about seventy-five miles from Sacramento. The formation of the gorge in the vicinity of the power station is such that a remarkable head of water can be obtained at several points where tributaries fall into the river from the cliffs above. One of these cataracts has a fall of over one thousand feet which can be utilized as a source of power. The station at Big Bend is served by a tunnel connected with conduits through which the water falls a distance of 400 feet. Therefore the pressure or head at this station of a given volume of water is far greater than that of the same quantity at Niagara or in fact any other hydroelectric plant in America.

So it is that equipment of extraordinary capacity has been installed at Big Bend. The turbines for example are each rated at 20,000 horsepower. In this development the water from the North Fork of the Feather River at the upper end of Big Bend is carried through a tunnel 15,000 feet long to a point in the hillside above the power house, from which point the water is carried through steel feeder pipes each 600 feet long to the hydraulic turbo-generators, the present effective head being about 420 feet.



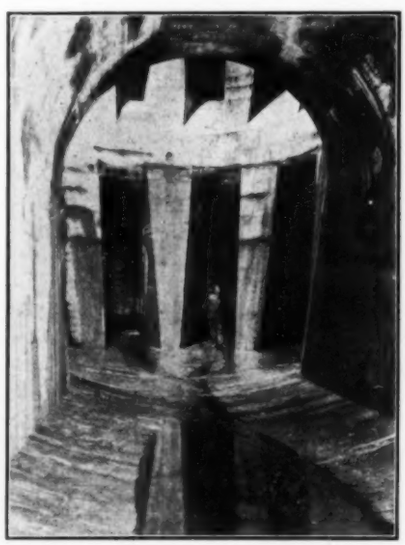
THE GREAT WESTERN POWER COMPANY'S PLANT AT BIG BEND, EIGHTEEN MILES FROM OROVILLE, CAL.

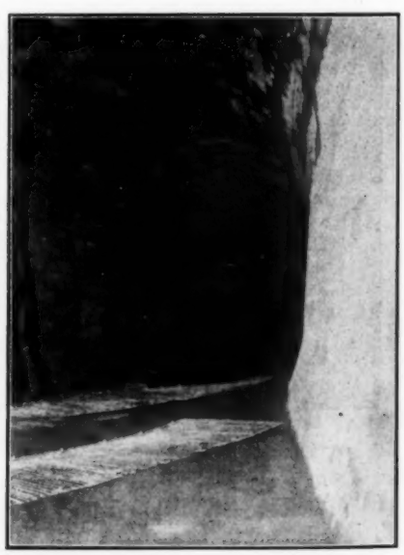
Feeder pipes are now provided for four 20,000-horsepower turbines, and connections with the header allow for four more similar units. The turbines have a capacity of 15,000 horsepower under the present head and will give 20,000 horsepower with the high dam, which will soon be under construction.



PIPE ANCHORAGES AND UPPER RUN OF CONDUIT LINES.

A feature of the development is the intake tower. This is built entirely of concrete on rock bottom, about 600 feet upstream from the dam. It is cylindrical in shape and is designed with buttresses and guides for racks with openings at four levels. It is located some distance from the river bank. By means of the tower, clean water and large gate openings are assured. It is also possible by this means to shut off water from the tunnel and make the tunnel accessible from the tower end. The water enters the tunnel at the bottom of the tower, and the craneway is used for lifting the screens and gates. The latter are lifted electrically, and close automatically without the application of any power whatever. The tunnel is bored in the rock throughout its entire length and is lined with concrete averaging twenty-one inches in thickness. The net cross-sectional area of the tunnel is 220 square feet and the design provides for a maximum pressure of eighty-seven pounds per square inch. The header pipe extends into the tunnel 125 feet from the portal. It is built of steel plate, varying in thickness from one inch to one-half of an inch, and has an inside diameter of sixteen feet nine inches tapering to nine feet and connecting with a surge pipe nine feet in diameter. The surge pipe is 302 feet long and continues up hill to an elevation of 940 feet and empties into a concrete spillway chamber, whence any overflow may escape to the river.





TUNNEL CONSTRUCTION EXCAVATED THROUGH MOUNTAIN.

The turbine wheels were designed and built by the I. P. Morris Company of Philadelphia, and are of the vertical shaft, inward-flow Francis type, operating at a speed of 400 revolutions a minute under a maximum head of 525 feet. The weight of the revolving parts of each turbine, 25,500 pounds, and the weight of the rotor to the generator, 119,500 pounds, or a total weight of 145,000 pounds, is carried by an oil-disk thrust bearing. This latter consists of two disks, the lower one stationary and the upper one revolving with the shaft.

The main generators, of which there are four at present in operation, are three-phase, revolving-field machines wound for 11,000 volts, sixty cycles, and

have a rating of 10,000 kilowatts each. The normal speed is 400 revolutions a minute. The alternators are of the vertical-shaft type. A double speed test of generators made at the factory showed

CONCRETE-STEEL CONDUIT.

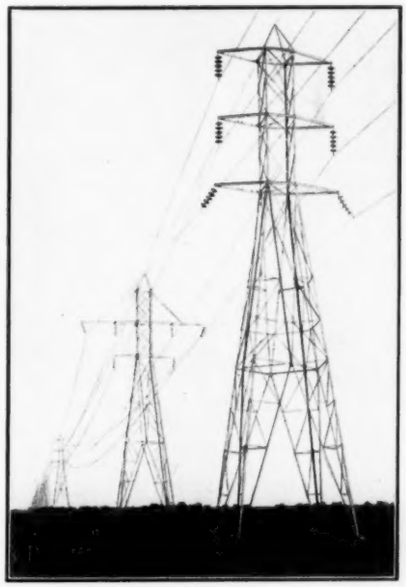
that the peripheral velocity at normal speed, 400 revolutions a minute, is 11,500 feet per minute, hence at double speed it is 23,000 or somewhat over four miles per minute.

The transformers are of the three-phase, water-cooled type, and are the largest ever built. They have a normal rating of 10,000 kilowatts at 100,000 volts delta on the high-tension side and 11,000 volts delta on the low-tension side at a frequency of sixty cycles per second. The transformer consists of a set of flat primary and secondary coils, placed vertically and surrounded by a built-up steel core. The coils are placed so as to admit of a free circulation of oil between them, which acts not only as an insulator, but as a cooling medium, by conveying the heat from the interior portions of the transformer to the tank and cooling coil by natural circulation. The primary and secondary windings are subdivided into several coils, each built up of flat conductors wound with one turn per layer so as to form thin, high coils which present a large radiating surface to the coil. The efficiency of the 10,000-kilowatt transformers as obtained from tests was as follows:

One and one-quarter load	98.95 per cent.
Full load	98.96 per cent.
Half load	98.66 per cent.
Quarter load	97.71 per cent.

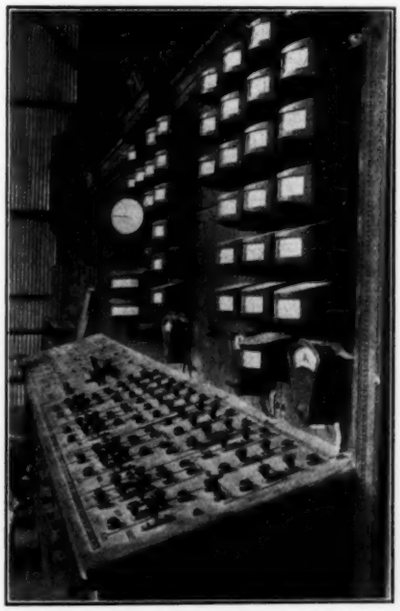
The generating station is seventy-one feet four inches wide and 183 feet six inches long, and houses the following equipment: Four 20,000-horsepower reaction turbines, direct-connected to as many 10,000-kilowatt, 11,000-volt, sixty-cycle, three-phase, vertical-type alternators; two 500-horsepower impulse wheels, direct-connected to 250-kilowatt, three-phase, water-cooled, oil-insulated, 11,000 to 100,000-volt, delta-connected transformers. Each of the latter, with oil, weighs over 200,000 pounds, and the core alone weighs thirty-five tons.

In the distribution of the current for power and light, 160 miles of main line for transmission have been built extending as far as Oakland across the harbor from San Francisco. The transmission is carried on steel towers. It is composed of 3-0 copper. Running along the top of the towers is a three-eighths-inch steel ground wire. The towers, which are seventy-five feet high above ground, are spaced 750 feet apart, and transpositions are made every three and one-half miles. There are approximately 1,200 galvanized steel towers, with many special towers, varying in height from seventy-five feet to 300 feet, for angles and long spans. In many sections very soft ground prevails, while in others marshes and water are crossed. The towers in these localities are erected on piles and concrete foundations. This is especially true of the section between Antioch and Sacramen-



100,000-VOLT TRANSMISSION LINE—STANDARD AND TRANSPOSITION TOWER.

OAKLAND SUBSTATION OF GREAT WESTERN POWER COMPANY.



THE MAIN SWITCHBOARD.

to, where the line runs across a number of small islands. At Antioch there are two 3,000-foot spans from towers 292 feet high to cross the San Joaquin river. All the towers are set in concrete. The transmission line is operating at a potential of 100,000 volts.

As already stated, the Big Bend serves a group of communities including Sacramento, Oakland and Folsom, in addition to furnishing power to a number of large industries outside of these places. Substations transform the current for commercial use at each of the principal centers of consumption. The Oakland terminal station contains two 10,000-kilowatt and three 5,000-kilowatt three-phase, water-cooled and oil-insulated transformers. The primary windings have a tension of 90,000 volts impressed on them and the secondary voltage is 11,000, the 5,000-kilowatt units being also arranged for a secondary potential of 55,000 volts. The switchgear for controlling the circuits is similar to that installed in the generating station at Big Bend. There are two incoming and six outgoing lines and the circuits connecting the substation and the steam auxiliary power plant also located in Oakland. Electrical energy is supplied here to the existing 50,000-volt high-tension systems of the Pacific Gas and Electric Company. This will give an idea of the installation in the various substations.

The construction of the power station in the river gorge was accomplished only under great difficulties. Twenty miles of roads were needed in addition to a branch of the Western Pacific Railway built to a point on the river opposite the site. By this route the massive machinery and much of the building material were hauled to the water's edge, and then transferred to the other side by an aerial cableway of the Lidgerwood system operated by powerful motors. This consisted of two steel cables supported on towers 1200 feet apart. Loads weighing thirty-five tons were taken across the river by this system and only by this means could the project have been completed.

Such is the first unit of the power to be generated. Another project of much greater magnitude is now being planned by the company. The natural flow of the Feather River during the dryest season is sufficient to enable 60,000 horsepower to be developed in the station at Big Bend, and by constructing a storage dam at Big Meadows, the source of the river, the current can be regulated so that 120,000 horsepower will be available at that point. Thus a reservoir will be formed, the surface of which will cover an area of approximately forty square miles, and the amount of water impounded will be forty billion cubic feet. This will be ample to operate the company's plants at their maximum capacity throughout two seasons of extraordinary drought. A third generating center will be a tunnel driven through the mountain, as in the case at Big Bend, to a point overlooking the power-house site, where the water will have a sheer fall of over 2,000 feet, thus giving a head capable of developing 300,000 horsepower according to the estimates of the engineers.

This remarkable project has been under the supervision of Messrs. Viele, Blackwell & Buck, electrical engineers. The Great Western Power Company is composed of New York and San Francisco capitalists. Its president is Edwin Hawley of New York.

Catalogue Experience Meeting of the Technical Publicity Association.

The Technical Publicity Association held a largely attended meeting on Thursday evening, February 10th, in the galleries of the National Arts Club, 14 Gramercy Park, New York. It was in the nature of an experience meeting on the subject of "Catalogues." An interesting and prolonged discussion, participated in by many of the advertising managers representing some of the most prominent of the technical manufacturing concerns and by representatives of publishing and paper firms, made the session a profitable one.

Considerable sentiment in favor of adopting standard sizes for commercial literature of this sort was found at the meeting. Many complained of the unevenness and lack of system among numerous catalogues, making them difficult to file.

An interesting paper was read by Martin P. Rice of Schenectady, N. Y. Many attractive specimens of current catalogues were exhibited by the speaker and also by other members.

A. P. Waterman brought to the attention of the members a special cover for catalogues. This is in the form of a binder for loose-leaf sheets, or sections of sheets, held together by fasteners; the back of the binder is folded so that it will expand to accommodate a great number of additional leaves.

C. R. Lippmann stated that certain engineering and architectural societies have adopted five by eight inches as standard for catalogue size. This is a convenient pocket size.

F. F. Coleman mentioned an interesting experience in connection with the filing of catalogues which varied in size from three by five inches to fifteen by twenty-four inches. He advocated catalogue sizes six by nine and nine by twelve inches.

F. E. Dayton said that nine by twelve had been adopted by the Master Car Builders' Association.

Chairman H. M. Davis, of the committee of the proposed uniform advertising contract, reported that the final draft of the contract which had been discussed at several of the previous monthly meetings, had been adopted by the members of the association without a dissenting vote.

Cleveland Rides for Three Cents.

Three-cent street railway fare, with municipal supervision of the car lines, has become a reality.

The receivership of the traction lines, which has existed since November 12, 1908, was lifted, and the Cleveland Railway Company took over the property, under an ordinance recently approved at a referendum.

This ordinance makes the rate of fare three cents, with one cent for a transfer, and provides for an ultimate increase, if necessary, never to exceed four cents, so as to give the company a profit of six per cent on the value of the property. This condition runs for twenty-five years under the ordinance.

Railway Sale Affirmed.

The decree of foreclosure and sale of the property of the Metropolitan Street Railway Company, of New York, has been affirmed in a modified form by the United States Circuit Court of Appeals. The appeal was taken by the Guaranty Trust Company.

The decree as amended says the purchaser is to pay at least $10,000,000 in cash, and that the whole system is to be sold as an entirety. The opinion, however, contains a provision that in case there is no bid of $10,000,000 for the whole of the property the decree can be modified so as to direct the sale in parcels.

ELECTRICAL NOTES FROM GREAT BRITAIN.

BY OUR BRITISH CORRESPONDENT.

Among the various subjects that have occupied the attention of the Institution of Electrical Engineers during the past month was that of losses off transmission lines due to brush discharge, with special reference to the case of direct current. The author, E. A. Watson, after alluding to the work of previous experimenters and the results obtained by them, described his own experiments. The conclusions arrived at by him as a result thereof were expressed as follows: There is a definite critical stress for which loss occurs from a direct-current line, just as for an alternating-current one; the direct-current stress required to produce this loss is the same as the maximum alternating-current one; this stress is positive or negative provided it is clean; for dirty wires the electric stress is lowered much more for negative than for positive charges; the critical stress is greater the smaller the wire diameter; the critical stress is reduced by reduction of the air, but not proportionately; the presence of water vapor in the air does not affect the loss or critical stress for a clean wire. Further, an actual transmission line does not behave exactly like a perfectly clean wire, but a factor varying from 1.5 to 2.0 should be allowed. This factor probably depends somewhat on the conditions of the district in which the wire is situated, and is probably less for a line in a clean mountainous region than for one in an industrial district. The loss is also affected by the presence of water vapor in the atmosphere especially for low values of the electric stress, and a considerable loss takes place before the wire is uniformly enveloped in a corona or becomes noticeably luminous. The loss which occurs with direct current when the critical stress is exceeded, is due to the production of gaseous ions at the surface of the wire. The actual current lost depends upon the amount by which the stress at the wire exceeds the critical value and partly on the disposition of the wires. With alternating-current lines, part of the loss may be due to the energy stored in the layers of air surrounding the wire and which upon breakdown becomes converted into heat, but this is insufficient to account for the whole loss which is observed and part of the loss is probably due to the same cause as that for direct currents. Mr. Watson's experiments were carried out at the University of Liverpool.

Consequent upon the London County Council's roadway embankment scheme the old Millbank Street station of the Westminster Electric Supply Corporation has had to be replaced by another works situated in Horseferry Road, the cost of the site, station and equipment equal to the Millbank Street capacity, being borne by the Council. Sir Alexander Kennedy, who is engineer to the corporation, recently permitted a large company of engineers to inspect the new plant erected and erecting. The new buildings will accommodate 6,600 kilowatts of turbo-electric plant generating 440-volt direct current, and about 14,000 kilowatts of motor-generator plant, the motors working with three-phase 6,000-volt current received from the Grove Road joint station of the Westminster and St. James companies, this current being transformed to about 440 volts for supplying consumers in the Westminster district. The plant at Horseferry Road comprises four water-tube boilers, two 300-kilowatt turbines each driving two 150-kilowatt generators in tandem (these are balancer sets), three 1,000-kilowatt turbines each driving two 500-kilowatt generators in tandem. Each of these turbines has separate surface condensers with air pumps. Water is sucked from the Thames, forced through the condensers and back to the river. A 2,000-ampere-hour battery of 200 cells is arranged across the three-wire system, and there are two battery boosters (hand-regulated). A 500-kilowatt motor is arranged with two 250-kilowatt generators for balancing, and there are two 1,000-kilowatt motor-generators, each with single 1,000-kilowatt direct-current machines. The three-phase motors of these motor-generators are all of the asynchronous type with slip rings and resistances for starting up. The switchgear part of the station comprises direct-current boards for controlling the turbine sets and the direct-current feeders, and a complete high and low-tension switchboard for the motor-generator plant. There is of course also a complete coal-conveying and ash-handling plant, and electric cranes serve both the turbine and motor-generator-houses.

There are several rumors afloat respecting railroad electrification schemes. It is only natural to expect important movements in this direction just now, especially bearing in mind the very satisfactory experience of the London & Brighton Company with its single-phase section. Some systems have been admittedly waiting for knowledge of the practical working results on this line, and now that the directors are able to show that in the first two months working they have lured back nearly the whole of the traffic that had been won away by electric-tramcar and motor-omnibus competition, as well as having carried on the two months running perfectly smoothly and free from any interruption of moment, not much more waiting is justifiable. Generally speaking, the time appears to be becoming more propitious for railway directors to take definite action. Railway stock is standing better in the market, trade seems to be brisker in many parts of the country, with a prospect of further expansion, and both the Lancashire & Yorkshire (direct-current) and the London & Brighton (alternating, single-phase) are going in for extensions on their already-tried principles. There are several other companies with whose electrical doings rumor is busy, but these have not taken a sufficiently definite shape to be alluded to in detail yet.

The Yorkshire Electric Power Company reports improvement, owing to existing consumers making bigger demands for energy as they extend the application of electricity to other departments, and to a steady growth in the number of new consumers. For the convenience of some large power users an overhead main is to be carried into a district not at present served. A fourth turbine set of the same type (Curtis) but double the capacity of the present ones, is now on order.

The Institution of Electrical Engineers has within the past month sent its reply to E. Garcke's demand that it shall devote a greater amount of attention to legislative and commercial matters relating to the electrical profession and industry. The correspondence has been issued for publication. The Council says that it has always given as broad an interpretation to the memorandum of association "as is con-

sistent with the avoidance of matters which, while possibly affecting one section of the industry beneficially, might be injurious to the interests of another section or contrary to the public interest." Mr. Garcke, who it should be mentioned may be taken as representing a large number of electric tramway and other companies (the British Electric Traction group), has been a member of the Institution for twenty-two years, and he has sent a lengthy communication to the secretary in reply to the above. The points brought out by him for emphasis are as follow: (1) that no industry of the magnitude and importance which the electrical industry has now attained can permanently subsist in England with adequate advantage to British capital and labor unless it possesses an authoritative, representative, and efficient organization for the promotion and protection of its general legislative, industrial and commercial interests. (2) That the electrical industry in England does not possess such an organization. . . . Apart from the Institution of Electrical Engineers, there is no organization in the country which is able to represent the industry as a whole . . . and this correspondence still leaves it open whether the Institution may be relied on to provide an organization as above defined. (3) The Council of the Institution having from time to time given its attention to certain legislative and commercial questions, many members have formed the belief that the Institution does in fact, in all cases, protect the commercial and legislative interests of the industry in a manner rendering any other efforts with this view unnecessary. (4) Many members are of opinion that the Council has not dealt with legislative and commercial matters in such a manner as to offer reasonable hope of preventing the industry from being very seriously prejudiced relatively to other industries and interests.

Mr. Garcke further on in his letter appeals to the Council to render the electrical industry "an inestimable service" by providing "at this juncture," an organization "to be constituted either entirely within the Institution or partly within and partly outside, so that steps may be taken with a view to improving the general industrial conditions under which electrical undertakers, manufacturers and contractors are working."

The Liverpool Overhead Railway is still suffering severely from municipal tramway competition. Its existence seems to be one continual straining after economies in cost of working. It has just installed two new generators in place of the old ones, and has re-equipped two of its trains with modern motors, controllers etcetera. Real improvement in the revenue can only now be looked for from a general revival of the trade of the port. The proposal to link up the line at the South End (Dingle Station) with the Cheshire Lines Railway, so as to form, along with the link at the North End (Seaforth Station) with the Lancashire & Yorkshire Railway, a complete belt route, is at present in abeyance. The cost of working per train-mile on the Liverpool Overhead, after deducting contribution to renewals fund, was 23.98 cents for the past half-year. It is the custom of this company's chairman to compare its cost of working with similar railways in London. The comparable figures for the city & South London are given as 28.2 cents and of the Central London, 51.12 cents.

The locomotive expenses are worked out thus: Liverpool Overhead, 7.92 cents per train mile; City & South London, 9.14 cents; Central London, 11.58 cents.

The traffic expenses are: 8.66 cents per train mile; City & South London, 12.2 cents; Central London, 18.46 cents.

The revenue per train mile, however, is as follows: Liverpool Overhead, 34.3 cents per train mile; City & South London, 61.42 cents; Central London, 86.8 cents.

The Cambridge Electric Supply Company added a record number of new consumers (175) last year, but the number of units sold decreased by 38,710. Both the increase and the decrease are due to the metal-filament lamp. A number of the celebrated colleges—Emmanuel, Pembroke, Corpus and Magdalene—have been secured as consumers but they were only connected well on toward the end of the year. Their full effect will thus be felt this year. Other companies are just summarizing the effects of the wire lamps on their 1909 business. For instance, the St. James & Pall Mall (London), one of the oldest, sold practically the same number of units as in 1908 (9,500,000), but there was a loss of about three and one-quarter per cent in the higher priced units for lighting, and an increase of about twenty per cent in the units sold for power. The lighting decrease is due to the wire lamps which the company finds a great aid in meeting competition from modern gas-lighting methods. The view is expressed that the company is about halfway through the change which will be completed in about two years more. A falling off in revenue is expected during that period and then it is expected that the normal rate of increase will be resumed. Efforts are being made to meet this falling off in two ways—(1) by making a reasonable increase in the charge for power; (2) by adopting improved methods to lower the cost of production. Power users are in future to pay $1.80 per quarter per rated horsepower in addition to the flat rate of two cents per kilowatt-hour. The plant at Grove Road Station has been improved. New turbo-generators with condensing plant have been installed and the consumption of steam per unit generated has been reduced by forty per cent. Further, bold scrapping of plant both at Carnaby Street and Mason's Yard stations is to be resorted to. Mason's Yard will have no steam plant in future, but will be used exclusively as a transformer station for high-tension supply. The old boilers at Carnaby Street will give way to new and modern ones with mechanical stokers. Better organization and control are also to be introduced. Turning now to a smaller concern—Smithfield Markets Electric Supply Company—here wire lamps have been almost unversally adopted throughout the market, reducing the receipts from sale of energy of about $20,000 to a modest $10,760. To meet this reduction the price to consumers has been raised, and in this way it is hoped that payment of a dividend will shortly be resumed.

Albert H. Bridge.

London, February 25, 1910.

Montreal Elevated and Underground Railway.

The Montreal Elevated and Underground Railway Company, for which a charter has been asked, will have a capitalization of $20,000,000. It will absorb the Montreal Street Railway, Montreal Light, Heat and Power Company and the Shawinigan Light and Power Company, all of which are operating in Montreal.

New Engineering Buildings for Kansas University.

The engineering school of the University of Kansas has been known for some time as giving one of the best technical courses in the Central West. So much has its reputation spread that new buildings for the accommodation of the engineering students became an absolute necessity. These buildings were erected through an appropriation granted by the State Legislature, and have only recently been dedicated to the use of the school.

ENGINEERING BUILDING, KANSAS STATE UNIVERSITY, LAWRENCE, KAS.

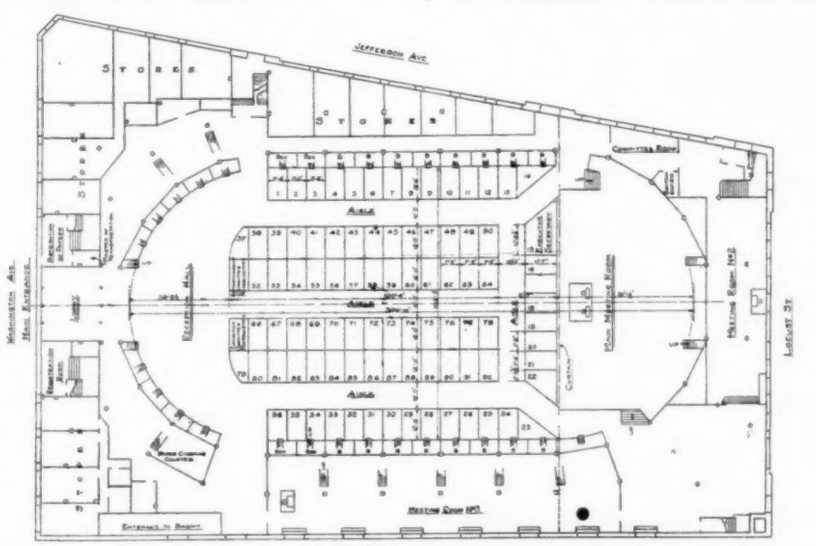
At the dedication exercises, which took place on the afternoon of February 25, several speakers of national reputation in the educational and engineering fields spoke encouragingly of the great strides that were being made in engineering education. Frank O. Marvin, dean of the engineering school, who has watched its development from the earliest days of the school, spoke on the wonderful growth of the institution. "Academic Efficiency" was the subject of a talk by Richard C. Maclaurin, president of the Massachusetts Institute of Technology. Ernest R. Buckley, president of the American Mining Congress, spoke on the subject "The Relation of Geology and Mining to the Industrial Arts."

After the conclusion of the dedication services the keys were delivered to the university by W. Y. Morgan, secretary of the Board of Regents, and transferred to the school of engineering by Chancellor Frank Strong, who presided over the meeting.

The engineering building has been named Marvin Hall.

The National Electric Light Association Convention.

Arrangements are proceeding for the thirty-third convention of the National Electric Light Association, wheih will be held in St. Louis, May 23-27, 1910. St. Louis offers exceptional opportunities for the exhibition of the products of the Class D members. The large Coliseum, a modern steel and concrete structure, has been placed at the disposal of the association for its meetings, exhibits, and general headquarters. The ground plan illustrated herewith will give an idea of the layout and facilities. One end of the arena will be completely separated by a heavy asbestos partition, making a quiet and spacious room. In addition there will be two smaller rooms for parallel sessions. The balance of the arena has been assigned to exhibition space.



FLOOR PLAN OF NATIONAL ELECTRIC LIGHT ASSOCIATION EXHIBIT, COLISEUM, ST. LOUIS, MO., MAY 23-27, 1910.

Arrangements have been made for ninety-two booths containing on an average eighty-five square feet. These will be built on platforms five inches higher than the floor, and will be suitably decorated. Four ten-foot aisles will provide access to every booth. At the entrance to the exhibition hall a large space has ben reserved which will be converted into a reception hall and general lounging place.

Through the courtesy of the Union Electric Light and Power Company, electric current for the operation of exhibits will be furnished without charge.

The coming convention marks the twenty-fifth anniversary of the association, and it is expected that it will be the best attended and most important thus far held.

The exhibition committee has been able to arrange the prices for booths at a little lower than in the past, and satisfactory arrangements have also been entered into with a transfer company for the forwarding of exhibits between the freight yards and the Coliseum. Detailed information will be supplied later by the committee, of which Frank H. Gale, Schnectady, N. Y., is chairman, and Walter Neumuller, New York, N. Y., is secretary and treasurer.

Copper Exports.

Exports of copper for the week ended March 3 were 7,281 tons. Since March 1 they were 3,753 tons, compared with 2,709 tons the same period last year.

Industrial Exposition at Detroit.

Plans are under way for an industrial exhibition to be held in Detroit, under the auspices of the Board of Commerce, June 20 to July 6, to accelerate the commercial and industrial interests of that city.

It is planned that 100,000 different articles manufactured in the shops of Detroit will be on exhibition.

Not only the products of Detroit's factories will be shown but also the process of manufacture. Machinery in operation will demonstrate the most modern methods of transforming raw materials into finished articles.

The exposition grounds will be adjacent to the Detroit River where a large building is to be erected to be occupied in conjunction with the Wayne Pavilion.

Metropolitan Street Railway.

Judge Lacombe, in the United States Circuit Court at New York, has signed an order permitting the Central Park, North & East River Railway Company to file claims against the Metropolitan Street Railway Company, the Morton Trust Company and the Guaranty Trust Company, and the Farmers' Loan and Trust Company, as co-defendant, as of September 24, 1907. The claims filed on behalf of the Central Park road are for personal property, horses, cars and equipment and a mortgage of $1,200,000 with interest which should have been paid by the Metropolitan Street Railway Company and is now being foreclosed by the Farmers' Loan and Trust Company against the Central Park road. A claim for cash has been made to the Metropolitan Crosstown Railway Company by the Central Park road and also for depreciation of the claimant's property while it was being operated by the Metropolitan Street Railway Company.

Minneapolis Electric Show.

Preparations are being made on an elaborate scale for the holding of the Electric Show at Minneapolis during the week of March 26. Twenty-five thousand dollars will be spent in preparations before the doors are thrown open to the public on Saturday evening preceding Easter Sunday.

The place will be the National Guard Armory, the main floor of which affords 15,000 square feet of space for exhibitors' displays, besides providing for six broad isles, and a large ornamental pagoda at the center from which the lighting effects will be controlled. There will be 100 of these booths on the main floor, each 150 feet square and additional displays can be made in the gallery.

The Armory is situated on Kenwood Boulevard, near Hennepin Avenue, and is well adapted for exhibition purposes, having a lofty interior which will permit of a very effective scheme for illumination. Search lights will be thrown upon a sky-like canopy, reflected from a central projector station; the effect will be a defused radiance from a source that cannot be seen, as no lights will be visible above the exhibitors' booths.

There will be very elaborate decorations which will add to the general effect as well as the ornamentation of the booths in which it is expected there will be many hundreds of electric lights shown. It is announced that all booth space on the main floor had been practically reserved a month in advance of the show.

The show is given under the auspices of the Northwestern Electric Show Association, incorporated recently, with F. G. Dustin, chief electrical inspector of Minneapolis, as president; George J. Cadwell, of the Cadwell & Brown Company, vice-president; C. D. Wilkinson, of the Western Electric Company, secretary; A. W. Leonard, of the Minneapolis General Electric Company, treasurer; J. L. Barnard, Bryan-Marsh Company, director; W. F. Smith, General Electric Company, director; W. D. McDonald, Westinghouse Electric and Manufacturing Company, director. The association's membership includes, without exception, representatives of all manufacturers, power plant companies and sales' agencies in the city. It has been organized with the intention of giving annual electric shows, following the lines of those of the electrical shows given at Chicago by the Electrical Trades Exposition Company at the Coliseum. Quite a number of the most interesting exhibits made at Chicago have been secured.

Efforts will be made to make the Electrical Show of general interest to the public in an entertaining way as well as an educational exhibition for the benefit of manufacturers and others who are and may become users of electricity for either motive power, light or heat. There will be a number of working exhibits similar to those at Chicago, which illustrated the practicability of electric apparatus on the spot. A dirigible balloon controlled by wireless is to float about the large auditorium, guided by means of a key-board manipulated on the floor below. It is proposed also to give open-air demonstrations of the practicability of the wireless control of dirigible balloons.

F. P. Dustin. G. J. Cadwell. C. D. Wilkinson.
A. W. Leonard. W. F. Smith. W. D. McDonald.
OFFICERS OF THE NORTHWESTERN ELECTRIC SHOW ASSOCIATION.

Engineering Building for North Carolina College.

Architect F. M. Simpson, of Raleigh, N. C., has prepared plans for the new $50,000 electrical and engineering building to be erected at the North Carolina College of Agriculture and Mechanic Arts, in West Raleigh. These plans have been adopted by the committee on building, of which W. H. Ragan is chairman, and the structures, according to these designers, will be three stories in height, fireproof and will be 170 feet in length by ninety feet in depth. This will be one of the most complete electrical and engineering buildings in the south, with a very modern equipment of apparatus, etc. Many prominent electrical houses have in the past donated valuable machinery and apparatus to the college for use in this department of the college curriculum, and the entire state is taking no little pride in the handsomely equipped building which will be ready for use within a reasonably short space of time. L.

Lecture at the University of Minnesota.

F. W. Darlington of Pittsburg, Pa., lectured before the electrical engineering students at the University of Minnesota on February 23, 1910, on "The Electrification of Steam Railways." In the course of his lecture Mr. Darlington discussed the general operating characteristics of direct, single-phase and three-phase railway motors, and compared the relative costs of the locomotives and of the generating and distributing systems. As he is an engineer of wide experience in railway matters, this lecture was one of more than ordinary interest.

Brooklyn Rapid Transit Franchise Taxes.

The Brooklyn Rapid Transit Company has paid to the Bureau of Assessment and Arrears $700,000 on the claims for unpaid franchise taxes. The Coney Island & Brooklyn Railroad Company has paid in $150,000. The payments were made with the understanding that the balances should not be pressed.

Power Plant Damage $100,000.

As a result of heavy rains $100,000 damage has been done to the dam of the Central Georgia Power Company on Ocmulgee River, eight miles below Jackson.

New York City Railway Suit.

By an order signed last week by Judge Lacombe, of the United States Circuit Court, William W. Ladd, receiver for the New York City Railway Company, is granted an extension of time until April 4 in which to take testimony in the suit against the Interborough-Metropolitan Company, L. L. Benedict & Company, Henry Clews & Company, H. K. Burras & Company, Hallgarten & Company, Marshall, Spader & Company, the Morton Trust Company, several other brokerage houses and about seventy other defendants.

The suit is for the recovery of $7,348,000 due as the unpaid portion of the price of stock of the Metropolitan Securities Company held by the defendants, and is the outcome of Receiver Ladd having failed to collect $5,271,582, part of a judgment rendered in his favor against the Metropolitan Securities Company. The large number of witnesses to be examined and the great mass of documentary evidence to be submitted occasioned the application for an extension of time.

Commission Publicity Wanted.

A determined effort to compel Mayor Gaynor of New York city and the Public Service Commission, for the First District, to furnish the Senate of the state of New York with full and detailed information of all plans adopted or contemplated for the construction of additional subways in New York city, together with information as to the proposed method of financing such construction, has been made by Senator Dennis J. Harte, of Queens, who has introduced a resolution to this effect.

In addition to the information referred to above, Senator Harte desires to know whether any part of the cost of construction is to be levied upon taxable property in any borough other than the boroughs in which subways are to be constructed. He also desires to ascertain if any provision has been made or is contemplated for providing rapid transit in the boroughs of Queens and Richmond.

Senator Harte declared that he based his resolution upon current reports that it was the intention of the New York city authorities, in conjunction with the Public Service Commission, First District, to spend upwards of one hundred millions of dollars for the construction of subways in the boroughs of Manhattan, Brooklyn and the Bronx and that the expense would have to be shared by the entire city of Greater New York, regardless of whether any branch of such contemplated subway system is to be included within a borough or not.

In his argument before the Senate, Senator Harte insisted that if the boroughs of Queens and Richmond are to be taxed for the proposed improvement, that they should be included in the scope of the additional subway system being mapped out. His resolution calling for the information referred to above was referred to the committee on cities.

Approve Three-Cent Line.

The New York City Board of Estimate approved the report of its transit committee, the members of which are the mayor, the comptroller, and the president of the board of aldermen, recommending the granting of the franchise to the Manhattan Bridge Three-Cent Fare Line, and instructed the chief engineer to prepare the form of the grant for approval.

The proposed line extends from Desbrosses Street ferry, North River, across Manhattan Island by way of Canal Street, across the Manhattan Bridge to Fulton Street and Flatbush Avenue extension, Brooklyn with a loop through the Brooklyn retail district.

Wagner Single-Phase Motor Patent Sustained.

Judge Smith McPherson, sitting in the United States Circuit Court of the St. Louis district, handed down an opinion March 4, in the Wagner Electric Manufacturing Company's suit against the Century Electric Company covering alleged infringement of the Wagner single-phase motor patents; three patents were involved. The decision was favorable to the Wagner Company, every patent claim in the suit being sustained. The decision calls for an injunction against manufacture and sale, and an accounting for damages and profits, and appoints a master to take the testimony of the accounting.

Application was made by the Century Company to suspend the injunction pending an appeal to the United States Court of Appeals. Judge McPherson granted a stay of execution of ten days, and will hear arguments on March 14 on this motion.

CENTRAL-STATION PRACTICE

Transmission—Interior Wiring

BOILER EXPLOSIONS.

BY CHARLES L. HUBBARD.

With the more general use of water-tube boilers, higher grade of workmanship in boiler construction, systematic inspection, and more skilled care in operation, disastrous boiler explosions in central stations are very rare. There are, however, still in existence boiler plants consisting of old-style apparatus installed many years ago, and also numerous small and medium sized isolated plants operated in connection with shops and factories, or the heating plants of large buildings, where the conditions are not so favorable to safety as in the large central stations. For this reason a little advice and caution to owners and managers from time to time may not be out of place. It is not expected in the present article to give a new remedy for boiler explosions, but simply to give in brief form some of the points to be watched. with some general advice leading to conditions of safety in any high-pressure plant. Matters of detail must of course come under the immediate care of those in charge.

The general cause of all boiler explosions is obviously an over-pressure of steam. This may be caused by the safety-valve failing to work at a critical time, or the boiler may have gradually become weakened so that it is unable to carry the pressure for which it was designed.

The reasons why a boiler is unable safely to bear the working pressure are: (1) Defective design or ignorance as to the amount of pressure which the boiler will stand; (2) deterioration from the effects of corrosion, incrustation and wear; (3) defective workmanship or material; (4) mismanagement.

In purchasing new boilers or when taking over a plant already installed, a competent engineer should be called in to make a careful examination of the arrangement and design, and to compute the strength of the more important parts. This should be placed on file for immediate or future use in fixing the working pressure to be carried. In some plants the steam pressure is raised from time to time as more power is required, and without data of this kind for reference, the danger point may be passed without knowing it.

Among the more important points to be noted in an examination of this kind may be mentioned the thickness and material of the shell, type and design of riveted joints, number and strength of stays, also noting whether any of them have been cut or bent to clear pipes or floats. Flat surfaces are sometimes found to be stiffened but not properly stayed, and the openings for domes and manholes are sometimes left without proper strengthening. Again, the boiler may be set too rigidly without due regard to the effects of expansion and contraction. Defective water circulation will often cause overheating, excessive incrustation, etc.; and failure of the feed apparatus to work properly may cause low water, resulting in overheating, rupture and explosion.

The strength of a boiler may deteriorate in various ways, among which may be mentioned corrosion (both internal and external), pitting or grooving, and fracture. These matters are looked after by the insurance companies, but both the manager and the engineer in charge should have a general knowledge of them in order to detect and avoid their occurrence so far as possible.

Weakness from corrosion or wasting is difficult to detect as it may extend uniformly over large areas. Drilling and plugging the plates is about the only way of accurately determining their thickness under these conditions. An explosion may also be caused by the formation of a pocket due to incrustation, and for this reason the interior of the boiler should be kept as free from scale as possible. Fractures are often caused by the admission of cold feed water, and these once started are likely to become enlarged by the fluctuation of steam pressure, aided by corrosion, until the boiler becomes too weak to stand the working pressure.

Fractures are of two kinds, those caused by weakness of the material and those due to too rigid construction. The latter condition is illustrated by the ordinary horizontal tubular boiler. In this case the fire is under one end, and the plates just above it being very hot, expand more than the rest of the shell or tubes. If the tube sheets are too rigid and cannot expand slightly, the tube holes are likely to become oval in form and leak. Furnace plates are sometimes fractured by too rapid cooling from an open furnace door.

Fractures are usually small at first and hard to discover, but increase in size quite rapidly. When a lap-edge fracture extends through a rivet hole into the plate it can usually be stopped by drilling a hole in its path and filling it with a rivet. When the fracture runs in a line between the rivet holes it is very dangerous as it seriously weakens the point. A plate of good material will usually give warning by leaking before giving away. Brittle plates are likely to rupture suddenly when least expected.

Overheating the plates softens them and so weakens the boiler. This may be caused by poor circulation, low water, or by the accumulation of scale; hence these conditions should be guarded against.

The third cause of rupture is defective workmanship and poor material. The first can only be guarded against by frequent inspection of the work as it progresses in the course of manufacture, and having the boilers constructed by builders of established reputation for thorough and careful workmanship.

Points to be noted in the construction are punching of holes instead of drilling, the latter being the correct method.

careless riveting, fractured rivet holes, broken rivets, improperly secured stays, welded joints, and fractures in flanging, bending, etc. Patching old plates with new material is apt to weaken them, especially if the removal of the old rivets and the placing of the new ones is not carefully done. The greater contraction and expansion of the new material causes severe local strains.

The fourth item is that of management. Explosions occur through mismanagement in different ways. One point of great importance is the safety valve. This should be of sufficient size to carry off all of the steam which may be generated by the boiler, and it should be lifted every day in order that it may not become rusty or stick to its seat. A stop valve should never be placed between the safety valve and boiler, neither should a lever valve be overloaded or wedged in place to stop leaks around the valve seat or to raise the steam pressure.

After an explosion has actually occurred it may seem that the cause is not of great importance, as the damage has already been done. This is not by any means true, as the careful investigations of boiler explosions have been of great use in guarding against similar occurrences in other plants. Hence, whenever an explosion takes place it should be promptly looked into, both to fix the responsibility as far as possible and to learn how to provide against future disasters. One of the reasons most frequently given is low water, because this is an easy way to put the responsibility on those directly in charge and so relieve those higher up. The owner or manager in every case of accident of this kind should do everything in his power to assist in learning the true cause, so as to avoid it himself in the future and also add to the general fund of knowledge regarding boiler explosions.

In the investigation of an explosion, the weights, shapes, positions, and directions of the scattered pieces should be noted, so that their original places may be known. The principal rupture may often be located by a comparison of the directions taken by the heavier pieces. The smaller fragments will usually take the direction of the escaping steam, while the heavier parts take an opposite direction, due to reaction.

The position of the fracture has a decided influence on the results. In case a large rupture occurs at the top of a cylindrical boiler, the steam and water may blow out of the hole, and the boiler, if strongly set, may remain in place. If, on the other hand, the vent were to occur on the under side of the boiler near the ground or floor, the effect would be very different, and the reaction of the escaping steam would probably raise the whole boiler through the roof.

The means taken to prevent boiler explosions have already been discussed, but may be briefly summed up as follows:

Only well designed and thoroughly constructed boilers should be used. The type is not of so much importance, but in large cities or in buildings where many people are employed it is usually better to use water-tube or sectional boilers as a safeguard.

Accidents from mismanagement may be greatly reduced by employing only thoroughly competent engineers.

Among the most effective methods of preventing explosions are the state laws compelling regular and thorough inspection and licensed firemen.

Plans for Michigan Power Merger.

Plans for the merging of the Michigan power companies were recently announced in the application of the Commonwealth Power Company to the state railroad commission for authority to increase its capital stock from $7,500,000 to $12,500,000 and to issue $35,000,000 in gold bonds. These increases are asked to carry out the scheme to merge into the Consumers' Power Company, the Commonwealth, Grand Rapids-Muskegon, Grand Rapids Edison, Jackson Light & Power, Pontiac Power, Flint Electric Power, Saginaw Power, Bay City Power and Au Sable Power Companies.

The application is signed by W. A. Foote, of Jackson, president of the Commonwealth Company, and it is announced that of the stock issue $7,500,000 will be common and $5,000,000 preferred stock. Taking up the proposed bond issue the application sets forth that $2,679,000 will be used to pay part of the purchase price of the properties listed; $6,071,000 to take up outstanding bonds of the Commonwealth, Grand Rapids-Muskegon and Grand Rapids Edison companies, and $26,250,000 to provide funds for making permanent extensions, additions and improvements to its plants.

Central Stations Versus Isolated Plants for Textile Mills.

Under the above caption an interesting paper was presented by Charles L. Main at a joint meeting of the American Institute of Electrical Engineers and the American Society of Mechanical Engineers, at Boston, Mass., February 16, 1910.

The author began by stating that inasmuch as a saving of ten per cent in the cost of power would represent a saving of not over one-half of one per cent in the cost of the product of a textile mill (materials and labor being the chief considerations), the location of the mill was not necessarily to be determined by the cheapness of available power. In recent years, however, the transmission of power by electricity has made it possible to locate the mills more advantageously for construction, light, railroad facilities, etc., and has made valuable water powers which on account of their location were hitherto valueless, and has enabled the construction of central steam plants to be located at the mouth of the mines or at tidewater where cheap fuel can be obtained.

The cost of producing power may generally be divided into (1) independent charges, or the part which is independent of the output, embracing fixed charges on the plant—as interest, depreciation, insurance, and taxes, and, to a certain extent, repairs; (2) proportional charges, or the part which is proportional to the output, including such charges as coal, labor, supplies, etc.

In general, steam plants may be said to have low independent charges, and high proportional or operating costs.

Waterpower plants are usually the reverse, with high fixed charge accounts and low operating costs.

Another item which should be mentioned as affecting the cost of power is what Dr. Steinmetz calls the "reliability-factor," which takes into consideration the spare machinery needed to insure continuous service.

The chief conditions which affect the cost of steam power, are: (1) Cost of fuel delivered to the furnaces. (2) Amount of power produced. (3) The load factor in its relation to fixed charges, whether the power is continuous and uniform, or intermittent and variable. (4) The net cost of power is reduced considerably in some concerns

where the waste heat of the power plant can be used in the manufacturing processes in the form of low-pressure steam or warm water.

The chief conditions which affect the cost of water power are: (1) Fixed charges on the development. (2) Amount of power produced in its relation to fixed charges. (3) The load factor in its relation to efficiency of wheels, pondage and reservoir capacity. (4) The cost of supplementary power necessary to make up for the fluctuations of the water power, if required.

Steam power costs the most per unit of power when produced in small amounts. The cost is increased for fluctuating loads, and when used for purposes where the load factor is small. By load factor in this instance is meant the average output in per cent of the full capacity of the plant.

Steam power costs the least per unit of power for comparatively steady continuous loads, as for paper mills and other similar industries; and the cost may be still further reduced where there is use for exhaust steam or other by-products from the plant. Such conditions as the last are found in color textile mills. Power costs the most in plants having a low load-factor with a variable load, and where there is no use for the by-products of the plant, as in a lighting or street railway plant.

The net cost of steam power for textile mills gradually increases from the case of the mill which can use all of the waste products which will have the lowest cost, to the case of mills making white goods where only exhaust steam for warming the building and drying the yarn in the slashers can be used. In order to give a general idea of the usual costs of power under ordinary conditions in this section of the country, an analysis of the cost of power for a station of 2,000 kilowatt capacity is given below. This station is similar to some which have been constructed within the last few years.

As electric drive is becoming so common in textile mills, it will be assumed for the basis of these costs that the stations considered below will be electric, and 2,000 kilowatt capacity, composed of two 1,000-kilowatt units.

In making up the cost of power, all charges have been considered except the interest charges and taxes on the cost of land. These are usually not large items in textile mills, and are variable. The cost of land for the station has also been omitted from the cost per kilowatt of the station.

In making up these costs, interest has been taken at five per cent depreciation and repairs on the apparatus for ten-hour power at five per cent and on the building at 2.5 per cent insurance and taxes at one per cent, making a total of eleven per cent on the apparatus, and 8.5 per cent on the building. For twenty-four-hour power, the depreciation and repairs on apparatus is increased two per cent, thus making the total charge thirteen per cent instead of eleven per cent. A small amount is added in both cases for incidentals.

With a steam engine plant, with direct-connected generators, the cost of the plant per kilowatt of capacity is about $125.00.

The cost of power from this station with coal at about $4.25 a long ton, in the pocket, would be about $33.00 per kilowatt per year of 3,000 hours, as a straight power proposition. This is equivalent to about $24.60 per electrical horsepower per year, and about $21.50 per indicated horsepower per year. This would be a cost of 1.1 cents per kilowatt-hour.

If steam turbines are used instead of steam engines, the cost of the station will be reduced to about $105.00 per kilowatt capacity.

The cost of power produced on steam turbines would also be reduced to about $29.50 per kilowatt-year against $33.00 for the engine plant. A part of this difference is made up from the reduced cost of the station and apparatus, and a part from the better economy of the turbines which we have assumed are using the superheated steam and high vacuum which is common practice.

If steam power were to be generated for twenty-four hours a day for six days a week, or say 300 days a year, as for a paper mill and a few of the textile mills, the cost of power would be about $57.50 per kilowatt per year for the engine plant and about $53.00 per kilowatt per year for the turbine plant. These costs reduce to 0.80 of a cent per kilowatt-hour, and 0.735 of a cent per kilowatt-hour, respectively.

In a public-service plant, even with the same load factor as for the ten-hour textile mill which would be high for most of these plants, the operating conditions would not be so favorable as in a textile mill as about the same amount of banking would have to be done, and the prime movers would have to operate at variable loads.

The cost of power for this type of plant is more, other things being equal, than for a plant of the same size for a textile mill having the same load factor. This is due to the effect of variable load towards a reduction in efficiency, and because of the greater cost of plant and consequent greater fixed charges per unit of output.

It should be borne in mind, however, that these public-service plants are usually of very large size, and that their output delivered has to compete in price with the cost of power from very small stations. This would give the advantage all to the central station as far as the actual cost of making power is concerned. To the cost of making the power, the central station must add the cost of transmitting, distributing, and selling it.

These additional costs probably form a very large part of the total cost to the purchase of the power. The distribution of power in a city is expensive, meters must be read, accounts kept, bills collected, etc. So that while a central station may deliver a kilowatt-hour at the switchboard for less than one cent, it can hardly afford to sell it for that.

Some years ago, the manager of some large public service properties, testified that the cost of power to a plant of this type could not be more than one-quarter of the gross income. A representative of another company made the statement recently that it cost his company more to meter the current for their smallest customers than it did to generate it.

It has been common practice for many years to use the by-products, such as exhaust steam and warm water, from the steam plant for manufacturing purposes, and for heating buildings, etc. It has been also very common practice to take steam out of the receiver, between the cylinders of a compound engine, for these purposes. In many mills all of the exhaust of simple noncondensing engines is used for manufacturing purposes.

The saving from using the exhaust of a noncondensing engine which would otherwise go to waste, is large, because there is no additional steam required for the engine, unless the back pressure is increased. Any use of the steam is

nearly all clear profit, and if all of it is used the only part left to charge to power is the difference in British thermal units due to the difference in pressure, and the condensation in the engine cylinder and jackets.

There seems to be no good reason why in time the practice of bleeding turbines should not become as common as bleeding engine receivers.

A few examples of the reduction in cost of power due to the use of the by-products from the steam engine plant, and the bleeding of steam from the receiver may be of interest.

In one colored cotton and silk mill, the power to run the mill was about 1,800 indicated horsepower and for manufacturing purposes about twenty-five per cent of the steam for this was required in the form of steam from the receiver.

Assuming the cost of power $33.00 per kilowatt-year with no bleeding, the cost chargeable to power with twenty-five per cent bled continuously is $29.75. The saving is $3.23 per kilowatt-year. This was for the use of low-pressure steam alone. Probably another material saving could be made by using the overflow from the condenser for water for dyeing purposes.

In another mill where much more dyeing was done, requiring a large quantity of hot water, also a large amount of exhaust steam for manufacturing and heating, the cost of power if no steam and waste products had been used, would have been about $34.00 per kilowatt-year, but when the proper credits had been allowed for items chargeable to manufacturing purposes, the cost was reduced to about $26.00 per kilowatt-year, or a reduction of about $8.00 per kilowatt-year.

In a plain or white goods mill, where no steam would be required for manufacturing, other than warming the building and slashing, the saving to be effected by using receiver steam for those purposes, would be about $2.00 per kilowatt.

About three-fifths of this, or $1.20 is for heating and the rest for slashing; so that $1.20 per kilowatt is the amount of the reduction which could be made in heating the buildings of an industry similar to a textile mill.

There are a few plants run by simple noncondensing engines exhausting into the dye-house and if the dye-house is running full there is very little change in the boiler room whether the engine is running or not.

There is one plant run by a simple noncondensing and a cross-compound engine. The exhaust from the simple engine and the condensing water from the compound engine are all used in the dyeing, finishing, and heating. The net cost of coal for power under the two last conditions is small.

In one mill which is run wholly by water power about 12,000 tons of coal are burned annually for dyeing, finishing, and heating the buildings. If a portion, or all of this mill had been run by steam power, the waste products of the steam plant would have furnished a portion of the heat required for manufacturing purposes.

The above are fair examples of the requirements in textile mills.

The cost of water power depends upon a great variety of factors, but the essential feature is usually the fact as to whether the combined result of all these factors is such as to make the cost of the development per horsepower delivered, a reasonably small amount, so that the fixed charge shall not be excessive. In other words, the allowable cost of water power cannot be materially more than the net cost of producing the same amount of power for the same purpose in some other satisfactory manner, usually by steam.

The cost of maintaining and operating a supplementary steam plant to make up for the shortage of power during low water, flood periods, etc., must be carefully considered as it effects the actual cost of power delivered from the hydraulic plant.

For the reason that water powers usually have high independent charges they are more valuable for use on loads with high load-factors than with low load-factors, and hence are more valuable for twenty-four-hour power than for ten-hour power.

There are usually more elements of chance and more unknown factors in a hydraulic development than in a steam plant, and these facts should be taken into consideration and properly cared for. It is the lack of consideration of some of these items that has caused some of the water power developments to get into disrepute.

On the other hand a development properly made and at a reasonable cost is a valuable asset and one which bids fair to increase in value if the price of coal increases in the future as in the past.

The value of a hydroelectric power to various industries will vary in approximately the same ratio as the cost of producing power in some other way, if considered as power, pure and simple, without taking into consideration other important items affecting the business, which are sometimes more vital than the cost of the power itself.

To illustrate the value and cost of power under different conditions, it may be well to mention the two following cases:

A price for hydroelectric power was submitted to a color textile mill, of 1.2 cents per kilowatt-hour. After due consideration, it was decided that the mill could not afford to accept the offer, the principal reasons being: (1) On account of the use of steam for manufacturing purposes and of the water of condensation for dyeing, the net cost of steam power would be less than the price of hydroelectric power. (2) It was considered better for the textile company to own and control its own plant, if it had the capital to build it, than to purchase current brought over many miles of pole line, and be tied up to some foreign company.

The cost of power per kilowatt at the switchboard from the hydroelectric company for the operating time of the mill was about $36.00 per kilowatt-year; and for the steam plant which the mill was proposing to install this cost was estimated at about $34.00 per kilowatt-year, but if the power had been bought from the hydroelectric company, the mill would have had to install and operate a boiler plant nearly as large as the one required for both power and manufacturing.

It was estimated that the use of the waste products from the steam plant would reduce the net cost of power at least $8.00 per kilowatt.

Steam central-station plants for the distribution of power to textile mills are being built and operated by the mills themselves to considerable extent, because it is acknowledged that a central station of large capacity can be run at less expense than several isolated plants, if considered for power only, without considering the other uses for steam and warm water. It is doubtful, however, if a central plant located at such a distance for the manufacturing processes as to make it necessary

to forego the saving which can be made by the use of the waste product of the steam plant can be run as economically as several scattered plants from which low-pressure steam and condenser water can be made of use. In some plants, it becomes a necessity to abandon this advantage owing to the growth of the plant and the necessity of separating the power plant from the mill.

Other advantages may be derived by the concentration of plants which warrant the change.

Nearly all of the recently built concentrated plants are for electrical transmission.

There are comparatively few hydroelectric plants owned by other corporations which are supplying textile mills in the North with a portion of all the power required by them.

The reasons for this are as follows:

Power costs more and can be sold at a greater price.

The power plants of textile mills are usually of a sufficient size to make them fairly efficient in fuel economy and fairly cheap to run in other respects.

There is usually no large amount of reserve machinery as the service is not severe, and as it is owned and controlled by the company itself, it can take some chances which could not be taken by a power company furnishing power to the mill.

The power plant is one of the items that goes to make up the whole plant, and is so considered. It is usually of very little trouble or care to the manager, and requires no additional salaries outside of the ordinary engineers.

The item of depreciation is not so great as it is in a central power station, for in the mill the cost of power is a small percentage of the value of the product and there is not the necessity of change so frequently in order to get the utmost economy that there is in a power station whose product is power only.

With the mill plant, there are no large charges to be made to transmission costs and losses, to selling and metering the power, to franchises, administration and other charges which are necessary and common to central power stations.

The most favorably situated and least expensive hydroelectric developments can make power and distribute it and sell it to plain textile mills at prices which will be attractive, but it will be quite difficult to sell at prices low enough to compete with the net cost of power to the color textile mills which use their steam power to the greatest advantages from power and manufacturing processes.

Surplus power which can be furnished for less than the whole year must be sold at low prices as the mill must maintain its steam plant for emergency use and run it when necessary, thus adding to the cost of purchased power the fixed charges on the steam plant, and such operating costs as may be met from time to time.

In New England but few of the textile mills have purchased power from any central station either steam or hydroelectric, but in the South, it is not uncommon practice for the mill to purchase hydroelectric power.

Some of the reasons for this are as follows:

Most of the mills in the North are older than those in the South and were built previously to the time of electrical transmission of power. They were, therefore, equipped with their own power plant, either water or steam, or both, and having made the investment there is not the incentive to change, whereas a new plant might save considerable investment in power plant by the purchase of power.

Most of the Southern mills are plain white mills, requiring no large amount of steam for dyeing and finishing, and requiring also less steam for heating the mills.

The mills of the North average larger in size than those in the South, and the larger the plant, the less the cost of power per horsepower other things being equal.

As a rule the northern manufacturers are more accustomed to the supervision of their power plants.

There are still fewer textile mills purchasing current from central steam plants, and the reasons for this are the same as stated for the hydroelectric stations.

The central-station men claim that the mills do not know how much steam power is costing them. This may be true, in many instances, but not in all. The larger mills know the cost pretty closely.

Some of the advantages to the purchaser are as follows:

In a new enterprise, in which the power plant has not already been constructed, there will be required less investment for the power plant with the purchase of current, than if the power is produced by the company itself, and the manufacturing company will have more capital for other uses in its business.

Less space will be required on account of the ommission of the power plant and perhaps a better arrangement of buildings can be made on that account.

For the above reasons, the author expects that a mill would be willing to pay something more than the bare cost of power if the power were purchased from outside, but the mill should determine what the net cost would be from its own power plant, taking into consideration not only the cost of power, but also the saving due to the use of low pressure steam and warm water for manufacturing purposes.

If power is purchased, there must usually be added the cost of running a boiler plant at the mill for heating and manufacturing purposes in making the comparison with the combined plant at the mill for power, heating and manufacturing purposes.

For the above reasons, the central station will have difficulty in contracting with large textile mills for power except under the most advantageous conditions for the central station and the most disadvantageous conditions for the textile mill.

Niagara Falls Power Company Bond Issue.

The New York Public Service Commission, Second District, has authorized the Niagara Falls Power Company to execute a refunding general mortgage to secure $20,000,000 six per cent gold bonds, maturing January 1, 1932, and to issue presently $9,074,000 refunding bonds. The proceeds of the bonds sold at this time are to be used, $2,998,000 to refund ten-year six per cent debentures due April 1, 1910; $3,000,000 series A to refund ten-year debentures due October 1, 1911; $1,980,000 series B to refund ten-year six per cent debentures due November 1, 1914; $1,096,000; series C ten-year six per cent debentures due November 1, 1914; also $1,021,000 refunding bonds to be used for the acquisition of property and extension and improvement of its plant and system.

ELECTRIC LIGHTING and ILLUMINATING ENGINEERING

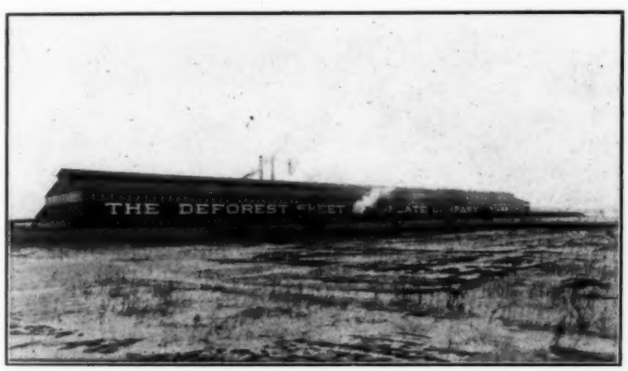
Successful Tungsten Factory Lighting.

The Deforest Sheet and Tin Plate Company, of Niles, Ohio, has been using tungsten lamps for illumination in its galvanizing and roofing departments for the last four or five months, and has been so well pleased that no other form of illuminant is now used in either of these buildings. The galvanizing room is sixty feet wide, and 120 feet long, fourteen and one-half feet to the roof chord, with the ceiling running entirely to the apex of the roof. This room is lamped with six 250-watt Sterling factory tungsten lamps. These lamps have burned over 1,500 hours, one lamp burning out in a little over 1,100 hours. This lamp was suspended directly over the galvanizing pot, carrying a constant temperature of 800 to 900 degrees, which the company states probably accounts for the short life of this lamp.

The roofing department is sixty feet wide, 240 feet long, with a wing sixty feet by 120 feet, fourteen and one-half feet to the roof chord, the ceiling running to the apex of the roof. This building is equipped with twenty 250-watt Sterling factory tungsten lamps which have burned for about 800 hours, with no burn-outs reported. The company states that the vibration does not seem to effect the lamps in the least, and that there does not appear to be any diminution in the illuminating quality of the lamps after 1,500 hours of service. The lamps burn bright and light, and flood the room with light.

The company is now experimenting in its rolling mill buildings with 500-candlepower Sterling tungstens, and an effort will be made to displace with these the flaming arc lamps which are now in use in the rolling mill building. From the experiments thus far conducted it is stated that the six-ampere tungsten lamps are equal in illumination to the type of flaming arc lamps used consuming between twelve and thirteen amperes.

Taking into consideration the cost of trimming and the reduction in the current consumed, the company expects to make a considerable gain in economy in this installation.



EXTERIOR VIEW OF WORKS OF DEFOREST SHEET AND TIN PLATE COMPANY, NILES, OHIO.

INTERIOR VIEW OF WORKS OF DEFOREST SHEET AND TIN PLATE COMPANY, NILES, OHIO.

Syracuse Makes Extensive Additions in Electric Lighting.

A report from Syracuse, N. Y., states that the Syracuse Lighting Company has under way a scheme for erecting ornamental electric-light posts, fifty feet apart, on a portion of South Warren Street in that city. Each post will be twelve feet high and surmounted by five large incandescent electric lights in frosted globes. The standards will be identical with those which have been in use for several months in front of the company's offices. Seventy of these will be erected on each side of the street. The company has subways through the street and connections laid, which will serve for transmission of the electric current.

Arthur D. Dudley, of the electric-lighting company, stated recently that the installation will be made for two years. The company, he said, will put up the posts, equip them, furnish the current from dusk to twelve o'clock every night of the year and maintain the installation. The expense to the property owners, he stated further, would be fifteen cents a front foot for a month. Practically every property owner on the street has entered into the agreement.

In a recent interview, Mr. Dudley stated that this plan of illumination is in no way experimental; that it has been installed in fifteen or twenty cities and has proved so satisfactory that in no instance where it has been tested has it been discontinued. Where a trial has been given the service has been extended until in many cities it now covers the principal business districts.

Some of the cities which have adopted this method of illumination are: Peoria, Ill., St. Paul and Minneapolis, Minn., Muncie, Ind., Wheeling, W. Va., Denver, Col., Des Moines, Ia., Wilmington, Del., Albert Lea, Minn., Appleton, Wis., Dubuque, Ia., Seattle, Wash., and Toledo, Ohio.

Glare, Its Causes and Effects.

At the meeting of the Illuminating Engineering Society, held in London, England, on January 11 last, the physiological and theoretical aspects of glare were discussed at much length. At later meetings of the society other phases of this phenomenon are down for consideration.

Previous to the meeting the following list of queries was circulated among the members of the society and many interesting replies were received:

1. What exactly constitutes a "glaring" system of illumination?
2. Evidence is needed of instances in which undue brilliancy of injudiciously placed sources of light has been unquestionably prejudicial to eyesight. Suggestions for the collection of data regarding eyesight and health and conditions of illumination enjoyed by school children, etc.
3. Is it desirable to recommend that sources of a brilliancy higher than a certain limiting value should never be used unscreened in interiors? Or that such sources should always be placed a certain minimum distance from the ground?
4. What is the maximum intrinsic brilliancy on the part of an illuminant which can be considered physiologically harmless, under ordinary conditions? To what extent is the glaring effect of bright lights dependent on the distance of the eye, on "brightness per unit area," and on the area and total amount of light radiated by a source? In what manner is the desirable intrinsic brilliancy of an illuminant governed by the brightness of surroundings and by the area over which the glare is distributed?

   To what degree is the sharpness of the shadows cast by concentrated sources of great brilliancy responsible for glare? Is the effect of glare rendered more acute by variations in the intensity of an unsteady source of light?
5. Is there any reliable and simple physiological test by which it can be readily ascertained whether an existing system of illumination is open to objection on account of glare? Could the opening and closing of the pupil-aperture be so used?
6. What instruments are available for measuring in a simple manner the intrinsic brilliancy of any luminous object? And what accuracy may be expected in such measurements?
7. Is excess of light of all colors equally harmful? To what extent are the prejudicial effects of incautious exposure to brilliant sources of light due to ultra-violet rays?
8. Is the intrinsic brilliancy of some sources used in the streets too high? And would a restriction of the existing brightness prove beneficial from the point of view of traffic, etc? Suggestions regarding the avoidance of glare from the headlights of vehicles, etc.
9. What is the best intrinsic brilliancy for illuminated signs and advertisements? And how is this affected by the distance away from which they are to be viewed?
10. Should any recommendations as to the limiting brightness of illuminants and illuminated surfaces, such as shades etc., in interiors, be made from the artistic standpoint?
11. Actual examples of practical cases (*e.g.*, well-known buildings, shop-lightings, etc.) in which insufficient attention has been paid to securing absence of glare or specially successful means adopted to avoid it.

The discussion at the meeting was opened with a paper entitled "Glare, Its Causes and Effects," by Dr. J. Herbert Parsons. The author defined glare as "the uncomfortable sensation experienced when a bright light shines directly into the eyes," and then proceeded to analyze in detail the physical and physiological conditions which give rise to the discomfort of glare.

Commenting editorially on the report of the meeting, *The Illuminating Engineer*, of London, England, says: "It is clear that physiologists in general recognize several distinct objectionable qualities of illuminants which are apt to be confused together as 'glare.' It is very desirable to discriminate between these different effects since, as has often been seen, confusion in this respect is apt to engender partisan controversy on the subject of different forms of illuminants, and the putting forth of claims which, in the present state of knowledge, it is difficult either to confirm or refute.

"We notice that several authorities point out the tendency to confuse the evil effects of excessive brilliancy with those connected with color and wave length. This the unlearned habitually do and it is often difficult to analyze even approximately what the 'man in the street' means by describing a system of lighting as glaring. Occasionally we hear the expression 'a nasty white glaring light,' in which an objection to a white quality of light is confused with its intrinsic brilliancy. Among authorities, on the other hand, we sometimes find glare attributed mainly to the effects of ultra-violet rays, as distinct from visible light, but this, as Doctor Parsons point out, should be considered separately from the effect of excessive brightness.

"On the whole, however, we find that experts seem to favor a definition of glare based on brightness and not color. Yet even this by no means settles the scope for difference of opinion. We find for example that while most writers lay stress on intrinsic brilliancy pure and simple as the main factor to be considered, Prof. L. Weber considered that *contrast* and the difference in brightness between a source and its surroundings, is at least equally important. This view is again contested by Doctor Stockhausen, whose very careful and exhaustive study deserves special mention. Doctor Stockhausen, while recognizing that such severe contrast is a source of eye fatigue, prefers to attribute this effect to rapid changes in retinal and pupillary adaption which he apparently classes as quite distinct from the true 'glare' effect, namely the exhaustion of the visual material in the retina by an excessive bright image.

"Dr. Louis Bell, who takes a somewhat intermediate view, is inclined to agree with Professor Weber that contrast between an illuminant and its surroundings is the most important point to be considered, and Dr. E. P. Hyde describes an experiment which leads him to suppose that the area of the luminous source is also an item to be borne in mind.

"When we come to the questions as to how far the size of a luminous surface, its distance away, and other factors, as apart from intrinsic brilliancy, influence impression of glare, we find general agreement that further study is needed, and, while several possible but quite different methods of measuring glare are suggested, notably those of Doctors Voege, Stockhausen, and Krüss, we find that here, too, it is recognized that before any definite recommendation can be made much further study is needed.

"Whatever view we take as to the nature of glare, we find general agreement that the most recent brilliant illuminants are often unwisely used, and that some steps should be taken to ascertain how far it is possible to devise practical recommendations to check this evil.

Decorative Lighting.

At the meeting of Armour Institute of Technology Branch of the American Institute of Electrical Engineers, held on the evening of February 17 in Physics Hall, Armour Institute, Chicago, Albert F. Horton, consulting illuminating engineer, of Chicago, made a very interesting address on "Decorative Lighting."

Mr. Horton dwelt particularly on the artistic principles that are so commonly neglected even by the practicing illuminating engineers. These he illustrated effectively by a large number of lantern slides showing interiors more or less elaborately decorated. As each was presented, Mr. Horton criticized it frankly, pointing out its good and bad points as regards the lighting fixtures and showing how the latter could be treated to conform harmoniously to the general decorative scheme of the room.

Tungsten Economy in the Lighting of Office Buildings.

For some time past some of the leading manufacturers of incandescent lamps have been making an active campaign directed toward replacing four and five-lamp clusters, equipped with carbon lamps, with single tungsten units of large size for the lighting of rooms in large office buildings. In some of the larger cities where there are wide opportunities for this development, there has been considerable success. Geo. R. Reed & Company, New York city, real estate managers and brokers, control twenty of the largest office buildings in the city, each equipped with its own electric plant. The company also operates nearly 100 smaller buildings and apartment houses.

INTERNATIONAL BANK BUILDING, 60 WALL STREET, NEW YORK, N. Y.

Almost at the introduction of the tungsten lamp the company's engineer, Mr. Class, saw the advisability of their use, and in nearly all of their buildings complete tungsten and tantalum lamp equipments have been installed.

The accompanying illustration shows the International Bank Building, at 60 Wall Street. It is a twenty-seven-story structure, facing on Wall and Pine Streets, New York, and was formerly equipped with four and five-light clusters fitted with carbon lamps. The sixteen-candlepower carbon lamps were replaced with 25-watt tantalum lamps. Although this was a step in the right direction, it did not quite suit Mr. Class, as far as increased illumination and current reduction were concerned. The clusters were shortened and converted into single-light fixtures, 100-watt, bowl-frosted tungsten lamps, with E-9 Holophane shades being used, in place of the five-light clusters, and sixty-watt, bowl-frosted tungsten lamps, with E-7 Holophane shades being used in place of the three and four-light clusters. This gave a very efficient illumination, and also pleased the tenants. There were about 700 of these equipments changed over. The side brackets were equipped with twenty-five tantalum lamps.

Indicating the economy, the fuel records show that during November, 1908, 440 tons of buckwheat coal were used. In December, 1908, 475 tons were used. For the corresponding months in 1909, 358 and 381 tons, respectively, were used, notwithstanding the fact that in November and December, 1908, the entire third floor of the building was unoccupied, whereas in 1909 the building was filled to its capacity. The tantalum and tungsten lamps used were furnished by the Sterling Electric and Manufacturing Company, of Warren, Ohio.

Sterilization by Ultra-Violet Light.

Many investigations are now being carried out in France on the employment of ultra-violet light for the sterilization of liquids, writes a French correspondent of the London (Eng.) *Times*, in a recent issue of that paper, since this method seems to offer a neat solution of sterilizing drinking water. The cost of sterilization by it promises to be less than that involved in the use of ozone, and hence a great number of appliances are being studied for the practical application of the process.

For the most part mercury-vapor lamps are utilized, the favorite types being the Cooper-Hewitt, made by the Westinghouse Company, the Heræus, and that of the Quarslampengesellschaft.

Some experimenters, such as MM. Courmont and Nogier, immerse the lamp in the liquid which is to be sterilized. This arrangement has the advantage that, as the ultra-violet rays are strongly absorbed by air, it assures the greatest efficiency of the apparatus. On the other hand, in these conditions the lamp is exposed to sudden changes of temperature that are apt to break the quartz tubes, which are relatively expensive on account of the difficulty of manufacture.

An elaborate investigation by M. Victor Henri on the action of the ultra-violet light will serve as a technical foundation for the new industry which seems likely to be founded on this method of sterilization. In the first instance, his studies have referred to transparent liquids such as ordinary town water, water of the Seine, and wa-

ter infected with various microbes. The bactericidal action of the rays varies greatly with the distance at which the bacteria are placed from the lamp. Thus, in order to sterilize water containing Bacillus coli with a Westinghouse Cooper-Hewitt lamp of 110 volts an exposure of 300 seconds was required at a distance of sixty centimetres, of 180 seconds at forty centimetres, of twenty seconds at twenty centimetres, and of four seconds at ten centimetres. With a lamp of 228 volts the time of exposure was thirty seconds at sixty centimetres, twenty seconds at forty centimetres, four seconds at twenty centimetres, and less than one second at ten centimetres. The temperature has scarcely any effect, the time necessary for sterilization not being sensibly reduced even if the microbial liquid is frozen, provided that the ice be transparent. The rapidity of the action is not the same for different bacteria.

The Westinghouse Company of Paris is actually constructing apparatus for the domestic sterilization of water. This works with a lamp of 110 volts three amperes, and can yield from 400 to 1,200 litres of sterilized water per hour. The lamp is not immersed, but is arranged within an enameled vessel, the water circulating beneath it in fan-shaped tubes, which bring it three times under the influence of the radiation.

For opaque liquids, such as milk, wine, or beer, a very thin layer of which is sufficient to absorb the ultra-violet rays entirely, sterilization can only be effected if the liquid is exposed in very thin layers. In the case of milk, for example, the thickness of the layer must not exceed twenty-five millimetres.

M. Billon-Daguerre keeps the liquid in immediate contact with the quartz tube. He has also constructed an apparatus in which the ultra-violet rays are produced by the electric discharge in a rarefied atmosphere of carbon monoxide, carbon dioxide, sulphuretted hydrogen, or sulphurous acid. In this case the lamp is not immersed.

Proposed Street Lighting for Wichita, Kansas.

Wichita, Kan., is lighting its "Great White Way" at present with 6.6 ampere multiple arcs. The Edison Light and Power Company is investigating a comprehensive system of street lighting, and recently sent out a visiting commission to look over the street lighting system in several cities. The party was composed of L. F. Means and Sam Stewart, city commissioners; Fred Smith, of the Commercial Club; ex-Mayor Graham, of Wichita; W. R. Morrison, superintendent of the Wichita street railway system, and W. B. Foshay, manager of the Edison Light and Power Company. The cities of Des Moines, Iowa; Aurora and Chicago, Ill., and Minneapolis and St. Paul, Minn., were visited.

The company proposes to furnish the city of Wichita with about 300 three-light electroliers, 400 single-light electroliers and 1,500 forty-watt series tungsten lamps. All of the forty-watt lamps are to be used in the residence district, and will be suspended from ornamental goose-necks. The electrolier lamps will be sixty and 100-watt tungstens of the low-voltage type.

Nothing has been decided as yet, but it is confidently expected that the city will close with the company on a proposition of this kind. The company will furnish the city with the equipment, including posts, and charge for them at a certain rate per lamp, which will include the installation charges, maintenance and cost of current, thus spreading the cost of the original installation over the life of the contract. This proposition really means that where the city is now spending in the neighborhood of $30,000 per year for lighting, and only has some 700 lamps installed, the company will be able to furnish them 2,200 lamps, and the cost per year, including installation, maintenance and current, will not be over $45,000 per year on a ten-year contract.

The post which has been practically decided upon is of the mission type, being square with a twelve-inch base, and six-inch top, with four-inch arms, so constructed that it can be used with either two or four arms, or no arms at all. Whether the post accommodates one, three or five lights there will be a symmetrical lighting system for the entire city.

The company's commission found that the business men and city officials of every place visited were unanimous in the opinion that there was nothing that was of as much importance to any city as the lighting proposition, and that a decorative, well distributed lighting system was the best advertisement that any city could have.

Lighting Scheme for Galesburg, Ill.

Some time next April it is expected that the city council of Galesburg, Ill., will pass a budget providing for the city's share of the cost of a new lighting scheme intended to make Galesburg the most brilliantly and artistically lighted city in the state of Illinois.

The idea is for the business men and the city authorities to work in unison, the former to raise the money with which to buy the poles and lamps, and the latter to stand the expense of putting all wires underground, doing the work and furnishing the electricity.

Plans by Engineer Connelly show that approximately 300 poles will be required. As each pole carries a cluster of five lights the total number of lights will be approximately 1,500.

The lights will be placed on both sides of the streets. Four poles, one on each corner, will be set at every street intersection. The poles will be placed at distances not to exceed seventy-five feet.

The poles will be of iron and probably extend twelve feet above the curbing. On top of the pole will be a single 100-volt lamp. A little below this will be four lights, of lesser voltage, on two arms intersecting at the center of the pole at right angles.

At the present time the city electrical plant is already worked beyond its capacity, but there has been talk of increasing the equipment at the city plant in order to furnish the extra current required by the new lighting scheme.

Tungsten Street Lighting in Glasgow.

After some experimentation, the Glasgow (Scotland) Corporation has decided to light the whole of Queen Street, Glasgow, with Osram lamps. It is expected further that the movement in this direction will be continued. The lamps will be of 100 candlepower for street corners; other lamp posts will be of the ordinary two-arm design each arm carrying a fifty-candlepower lamp.

Extra Lights for Philadelphia.

An allotment of five new electric lights to each of the forty-seven wards of the city of Philadelphia was made a few days ago at a very short session of councils' electrical committee. These new lights will be paid for from the annual appropriation to the Electrical Bureau for that purpose, the sum having been shaved down until that is all it will now provide.

Low Voltage Tungstens for Central Service.

To the Editors:

I have read with great interest the article in the issue of February 5, page 287, entitled, "A Successful English Experience with Tungsten Lamps." To review the essential feature of this article it might be well to call particular attention to the contract offered by the Harrogate, England, Lighting Corporation.

I. Consumer must supply his own lamps.

II. Each apartment in which a lamp was installed must be adequately lighted by lamps in the daytime.

III. The maximum number of lamps to be lighted at one time to be declared at the commencement of the contract.

IV. The minimum number of lamps applied for to be two and the maximum six, each taking thirty watts.

V. The charge to be sixty-six cents per quarter per thirty-watt lamp, payable in advance.

This subject is one of unusual importance and of great possibilities for electrical companies. If this flat rate system can yield a revenue from $150 to $200 per kilowatt year while the ordinary systems of charging with meters average under $100 per kilowatt year, is not this system worthy of wider application?

With low-voltage systems employing lower voltage to get a lower wattage with Tungsten lamps and also a more durable lamp, however, how is the use of fans, electric irons, and motors to be taken care of? Where no meter is used an automatic transformer could be installed to give the regular multiple voltage for the heavier apparatus and utilize low-voltage taps for the lamps. Why is not this feasible or desirable?

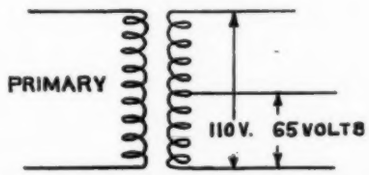
How would it do, instead of having a winking or limiting device, to have a device which would record an excess over the agreed amount every time such excess was used? This could be a simple magnetic device which would report that part of the excess by a mark on a tape or strip recorder; or a cheap meter could be used and so connected that it would register when the customer was using current in excess of any agreed limit, the customer paying for the excess registered. The customer could be charged at some low rate, say, three cents or five cents per kilowatt hour in addition to his regular flat rate charge when he exceeded his agreed limit. This plan has worked well in Montpelier, Vt., and has given a fixed income to the company with protection against abuse of the system.

This plan has the advantage that the fixed rate can be easily made to include the cost of lamp renewals, the company furnishing such and a customer paying a fixed monthly sum for current and lamps. This approximates for tungstens the desirable conditions given by the free renewal plan with carbon lamps.

The thing that appeals to me is that by this system the tungsten lamp becomes at once the desirable lamp for any company to employ, and one can easily conceive of a company establishing such a system universally, employing nothing but tungsten lamps, as no other lamps effect the results on the plan considered.

This plan is different from that of the differential rate and the Doherty system of charging. The customer is given a fixed charge for his service that does not tend to hold back and to keep his consumption down. Furthermore, it is not complex and can be easily understood by the consumer.

With the present system of charging the tungsten falls between the indifference to its use by the central station on the one hand because on the meter system of rates it does not make much difference what type of lamp is used, and on the insufficiency of saving to the customer as the meter rate makes the saving it secures to the customer too small to influence him in taking the pains and expending the money to secure the tungsten lamp.



AUTOTRANSFORMER AND LOW-VOLTAGE SUPPLY FOR TUNGSTEN LAMPS.

To make the tungsten lamp universal in use, and this desideratum is agreed by all to be essentially good from a standpoint of improved and economical lighting, the central station has got to take it in hand and supply it to the exclusion of all other lamps. To bring this about there must be a plan which makes it to the central station company's interest to use tungstens and nothing but tungstens. The flat rate charge for a given service in number of hours used and amount of wattage (number and size of lamps), with the proper protection against excess use or abuse, seems to fit this condition better than any other. The system should include the charge for the lamp, which the company should furnish, the customer buying the first installation and thus remove the objections which occur when the customer buys his own lamp renewals.

LAMPMAN.

February 28, 1910.

Dinner of British Illuminating Engineering Society.

The first anniversary dinner of the British Illuminating Engineering Society was held at the Criterion Restaurant, London, Eng., on Thursday, February 10, 1910.

A large gathering of prominent engineers was present, representing nearly every technical society in England.

The Illuminating Engineering Society was founded in 1909, and at this meeting its work during the past year was reviewed and highly commended. The future work to be accomplished was outlined and sincere expressions of co-operation were offered by representatives of the allied societies.

An English Rate Scheme for Electric Lighting.

The Town Council of St. Helens, an enterprising township situated a few miles from Liverpool, England, has made a special rate to tradesmen using electric arc lamps, as follows: A charge of $5.00 per year for the hire of a lamp, and six cents a kilowatt-hour for the current consumed; an inclusive charge of $21.00 per lamp per annum, energy to be supplied from dusk to closing time; or an inclusive charge of $19.00 a year for lamps owned by users, with a discount of five per cent for the use of six or more lamps by a single person.

New York Electrical Show.

The Fourth Annual New York Electrical Show, which promises to be the largest trade exposition ever seen in the east will be held at Madison Square Garden, New York city, from October 10 to 20, inclusive.

TELEGRAPHY—TELEPHONY, and WIRELESS.

A TALK ON RURAL LINES.

BY A. E. DOBBS.

A trip through the Ozarks a short time ago has demonstrated to the writer more than ever before that even the poorest kind of telephone service is better appreciated by farmers than none at all. Living as these do among the scenery, remote from railroads, remote from each other and on rather poor land, where they have to scratch the soil in spots to obtain a comparatively poor living, each and every one has his telephone, purchased, generally, with his own money, the same as a harrow or cultivator, and each section of the line owned jointly with his neighbors.

These co-operative lines, built by the most inexperienced amateurs, with only such advice as they can sometimes obtain from trade catalogues, follow mountain roads which rarely pursue a straight line for more than 100 yards, hang on poles cut from such timber as can be found in scrub oak hills—which are set two feet deep and hence lean at all angles—strung on trees where these are convenient, run through trees which are never trimmed, with poor conections from end to end, still convey the messages given them, as best they can, from house to house as well as to the nearby towns where there is likely to be an exchange of no better construction than the farm lines.

The service given over these lines is a horror to a telephone man, but while each subscriber grumbles about the service and each blames all the rest of his partners for the bad conditions, not one of them ever thinks of giving up his telephone, for each realizes that even his poor equipment gives him a fair talking service (sometimes), and is therefore much better than complete isolation. Verily we have become slaves to a very small, weak, electromechanism.

As it might interest the readers of this journal to learn the conditions under which a telephone will talk, not only over a single line but on two or more lines, of a similar character, connected together, the following list of electrical misdemeanors will prove interesting. Remember that all of these faults are often found on a single line and that when lines are connected the troubles are multiplied by two:

Lines overloaded.—Fifteen telephones to each line is a very light load for the most of them. Many of them have thirty or more. They are all grounded lines, which makes signaling difficult on account of the multiplicity of calls and poor ground connections. If the party wanted does not respond to the first call, eavesdroppers will prevent any other call getting through unless some of these eavesdroppers pass it along (which they generally do), and the party wanted will then be reached only after long delay.

Hook joints.—Owing to fear of lightning, the connection from the pole line to the house wire at the front porch is made by bending the ends of the wires over and hooking them together; when a thunder storm approaches, they simply unhook this connection and let the outer end drop on the ground, leaving it there till the storm is over. Should any one of them forget to re-establish the connection the neighbors hunt him up and remind him that the telephone line is out of commission.

Weak grounds.—They seem to have the idea that any piece of iron, wagon rod, wagon tires, harrow teeth or any old thing stuck in the earth and wrapped a couple of times with a No. 18 copper wire, will insure them good telephone service. I have seen them as shallow as six inches, and few of them more than two feet in a soil that was almost as dry as dust at that depth. Of course the soil is rocky and rods are hard to drive, so they quit driving. The idea of soldering the copper house wire to a rusty piece of iron never occurs to them and it is doubtful if they could do so, even if they had the means for doing it.

Trees used as poles.—Some lines are built with very few poles, trees along the way being used instead. While a tree is more firmly rooted in the ground than any pole can possibly be, it also sways in the wind with sufficient force to tear off ties or brackets. Where the tree is topped this is not the case, but growing sprouts will soon completely mesh the wire unless they are cut away. The pulling off of brackets also lets the wire down into the road or fields, where teams and stock may run into it, or, at least, it is let down into other trees or brush. Farmer boys do not know how to make slip or swing ties in cases of this kind.

Poles are generally of native timber, which is well enough except that they are too light. Poles are also not set deep enough, as the farmer cannot understand why a hole that will support his fence posts will not hold a telephone pole fifteen or twenty feet in length.

Trees never trimmed.—It is hard to make farmers understand the value of insulation to a telephone line. "Have they not ocular, auricular and oral demonstration of the fact that a telephone line that swings against at least 100 tree limbs to the mile will talk?" "What, then, is the use of worrying about a few limbs?" "There are instruments made that are guaranteed to talk over any kind of a line; all they have to do, then, is to buy instruments of that kind." Also: "What is the use of buying brackets and glass insulators when they can buy porcelain knobs much cheaper; the Deer Creek line uses knobs nailed to trees and it talks?"

I have not only seen lines with 100 tree connections to the mile, but spur lines a mile or more in length supported on forked sticks resting on top of the ground where they crossed corn fields, and so low that the corn grew up around them. Yet there were parties

connected to this line who insisted that *their* line was in good condition (by which they meant their own particular section of it) and could hardly be made to understand that a leak on one part of a bridged line was as bad as on another section or that a ground on a spur put the whole line out of business. By the way, many of these people will report that their lines are clear when the most casual inspection shows them to be full of "bugs," as almost every factory correspondent well knows.

Lightning arrester not properly connected.—This is a frequent source of trouble, where the fuse and carbon block is used, for, while in some cases the carbon blocks are left out altogether, in others the telephone side of the line is connected to the ground plate and the mica taken out from between the carbons to make the connection complete while the ground wire was not connected at all. There are few of these properly connected or cared for on country lines of this kind. These carbon plates are not usually large enough. I would prescribe at least one and one-half square inches of surface to each plate. Metallic circuits are rarely used in these lines, hence when several lines pass along the same road there is cross talk.

The continual use of telephones by eavesdroppers runs the batteries down very rapidly. As these are not renewed except at long intervals, or, until they refuse to give any service at all, conditions can be imagined. Farmers hate to buy batteries so often, but they have also found out that the battery works whenever the receiver is off the hook. This led some to invent a battery switch. It is simply a knife switch set on the side of the box through which the battery wire is looped, so that, now, when some answer a call, not their own, they throw the switch open and save battery.

Bridging and series instruments on the same line.—It looks odd to see a bridging line looped through a series ringer, but as each one buys his own instrument wherever he pleases it is sometimes the case that we see a mixed line of this kind.

I have even seen a 1,000-ohm ringer looped in series. Most of these lines combine to put up a switchboard of their own in the nearest town and pay some one for attending to calls. In one case I knew of a board connecting to 184 telephones and the operator and his family, some of whom had to be at the board all the time from six in the morning till ten at night, received the munificent remuneration of ten cents per telephone, or $18.40 each month. To make the matter more aggravating, it is harder to get a call over one of these lines than it is to get a toll call from Cleveland to Joplin. I have often seen the operator work hard for ten minutes to get a call through the board on lines not over ten miles in length. To get their party the first call is the exception rather than the rule.

In older exchanges where the town systems were built first telephone men are able to control this class of business for the reason that they went out to the farmers and built reasonably good lines before the farmers got started doing this work for themselves. In a year or two when they have had more experience they will learn what is needed for good telephone service and, like their fellows in the older states, will have good service.

Incidentally I learned many things needed in country line development that manufacturers generally do not supply, but that will be featured in another chapter, for there are some things the man in the factory can never find out for himself.

Newspaper Technic.

An example of the vagueness of the occasional newspaper account of electrical matters was seen in a note contained in a Pennsylvania paper. The newspaper reporter undertook to explain what the reasons were for changing a certain telephone line from an overhead to a conduit system. The lineman is quoted as having said that there was trouble in overhead lines caused by the "electric currents known as electrolis."

The following extract is taken from the newspaper note: "The electric currents, known as electrolis, in the air have become so strong that it is impossible to run a wire more than fifty miles without grounding, even at ten miles the currents gathered from the air will almost tear their arms from the sockets and they have frequently been against it where at ten miles the current was strong enough to burn off a wire or furnish power for a low resistance electric bulb."

TRAIN DESPATCHING BY TELEPHONE.

BY C. H. GAUNT.[1]

Hardly a man of large influence in the field of train operation advocated the supplanting of the telegraph by the telephone during the first twenty-five year's of the latter's successful use. Even after the clear long-distance transmitter had been generally established the railroad managers hesitated to interfere with the long wedded union of the telegraph with train movement. But the fine, practical minds of our great railroad managers have to be suddenly changed sometimes when a combination of circumstances brings about a result that has not been foreseen. Some may claim that the use of the telephone in despatching trains has long been made of sufficient importance, and been advocated. Possibly so, but only during the last few years have trials been made of sufficient importance, and upon a large enough scale, to prove anything. When proof is demanded by a practical-headed train despatcher, it must be capable of but one construction—absolute.

The Santa Fe established its original telephone train-despatching circuit in June, 1908, in the dry climate of Colorado. It was not fitted with the improved apparatus now available, but there could be only one construction placed upon the reports received upon its operation—it was a success. As soon as this was realized immediate steps were taken to extend the introduction of the system to widely separated sections of the lines so as to test it in all conditions of climate. During the early part of 1909, 1,962 miles of telephonic train-despatching circuits were in operation upon the Santa Fe Railway, in the states of Missouri, Kansas, Illinois, Colorado, New Mexico and California. The longest circuit reaches from Fresno, Cal., to San Francisco, 203.1 miles, contains thirty-two stations and is successfully operated through the "fog-belt" adjacent to San Francisco, where the telegraph is used only with great difficulty. The operating circuit upon all of these lines is a pair of 210-pound-per-mile copper wires carefully strung and costing in the neighborhood of $100

1 Assistant General Manager and Superintendent of Telegraph, Atchison, Topeka & Santa Fe Railway.

per mile. There is at present under construction 1,520 miles more, which will give a total length of about 3,482 miles of telephone circuits.

The results of this extensive trial, while really astonishing, should hardly be so considered, for they are but the natural consequences of human tendency, and an analysis of the telephone method will convince anyone that it will almost completely displace the use of the telegraph in moving trains, notwithstanding the expense of installation and the difficulty in overcoming the force exerted by the widespread use of the telegraph method.

The telegraph is used by the train despatcher in the intricate operation of his trains for one purpose only, that of communicating with the operators scattered along the stretch of railroad. Long use has developed a certainty of action in telegraph manipulation that commands the respect of all. But how often has a half frantic despatcher, loaded down with the complicated problems before him, wished he could use his voice to the men with whom he must communicate and thus avail himself of the rapidity of action, the definiteness and security that would follow?

To the despatcher time is the one thing that must receive the greatest consideration. It may be assumed that a man can utter words with a speed equal to the operation of his mind. But the train despatcher, in using the telegraph, has always been obliged to transmit his words at a speed but one-tenth his capacity to express himself, and also to receive a reply at the same rate. That being the case, of course a train-despatching system had to be adopted that would deal with a very small number of expressed ideas, and eternally and always the despatcher must come down to the limitations of the telegraph. In other words, the whole operation is inharmonious and does not tend to a result along the most natural channel. True, in the issuance of "orders" themselves, the speed, in telephonic manipulation, is limited to that required to write the words in longhand. But all directions of a collateral character, the receipt of important information and the instantaneous descriptions of situations that a despatcher must understand can be given and received at a speed limited only by that of a human utterance.

And what does that mean? It means that the despatcher has been permitted to multiply the time within which he may form his plans of train operation fully three times. This, of itself, further means that his mental calculations are vastly improved in accuracy and general value. The despatcher is permitted to issue his orders at the times he originally outlined, and there is a coherence, a consistency and a union in his methods not possible where less time is available. This condition largely reduces the liability of error of action and, conversely, allows additional time for the discovery of error, important or unimportant.

By the use of the telephone the despatcher is relieved of that long continued and aggravating operation of calling an office by repeating over and over the telegraphic letter or letters used for that purpose. There is established at each office along the road, in the same circuit with the telephones, a small and compact instrument called a selector. Connected with the selector at each office is also an electric bell operated by a couple of cells of dry battery. The despatcher has within easy reach a number of buttons upon a board, each button being designated by the name of the station that it is designed to call. By merely pressing such a button the selector in that particular station is operated, to the exclusion of all others, and in a few seconds the bell is ringing loudly. And, to show the completeness of this calling arrangement, the despatcher also hears in his telephone receiver the flutter of the bell and therefore knows that it is ringing. The despatcher can stop the call when he likes, and a short ring generally arouses an immediate response. But, if not, the call may be continued until the answer is received, something that does not often occur, because an excuse for not answering does not have the same weight where a bell rings loudly that it does where an instrument may be feebly ticking off the call. And if it were not enough that the time used in calling offices should be practically eliminated, there is the further advantage that these calls may be made upon the line at the same time telephonic conversation is being carried on, one operation not interfering with the other.

If the operator at the station wishes to communicate with the despatcher, he simply removes the telephone from the hook, places it to his ear, and if there is an opening for him he states the name of his station and the despatcher instantly replies by saying "despatcher." The "reporting" of trains—that is. the stating of the time of passing or of the arrival and departure of trains at stations—is made to the despatcher much more quickly than is possible by telegraph, and, where messages are necessary, they may be transmitted by telephone with the speed at which the operator and despatcher may be able to write longhand, and with equal accuracy to the telegraph. Information regarding derailments or other trouble is conveyed to the despatcher by verbal and complete narrative, either by the station operator or the conductor of the train involved, so that the despatcher is in immediate touch with the situation, while in using the telegraph for this purpose message after message is required before there is a complete understanding of details."

In transmitting "orders" by telephone, the despatcher spells out in full the names of stations, numbers of engines and trains, the times and the proper names involved. This, however, is done with speed and precision, and the despatcher writes the order in the record before him as he gives it, not waiting to make the record when it shall be "repeated" to him by the operator, as is done in the telegraph operation. This change in making the record of the order from a subsequent to an initial one is very important from the standpoint of absolute accuracy.

Unquestionably there are doubters still of the complete success of the telephone in train despatching and the allied services. The change—if it shall come—from the use of the telegraph to the telephone in moving and making up trains, in the handling of the thousand and one details connected with the immediate motion of traffic and in giving to all the employes concerned in the work the benefit of the interchange of judgment through direct conversation, is revolutionary.

But it brings quick action where formerly it was slow. It takes from the despatcher the necessity for operating his trains through the medium of a large number of telegraph operators of varying ability. It brings to bear upon this most important of services direct conversational contact between all

the interested parties, something of greater value to this particular work than can be fully described. There is harmony of action, harmony of temper, human understanding and personal relations of the most satisfactory character. There is the certainty that more movements will be better planned and executed, and that the art of direction of operation of trains will be greatly advanced and the work more safely rendered.

Despatching Trains by Telephone on the Boston & Maine Railroad.

The Boston & Maine Railroad has taken steps to equip two new divisions of its line with telephone equipment for train despatching. One of these extends from Concord, N. H., to White River Junction, Vt., a distance of seventy miles, and the other from Concord to Woodsville, N. H., ninety-five miles. Each circuit is to be equipped with twenty-five way stations. On the first of these divisions the despatcher is located at Concord and on the other at Woodsville.

In September, 1909, the Boston & Maine cut into service its first telephone train-despatching circuit between Boston and Fitchburg, Mass., a distance of about fifty-one miles. Service on this line has proved so satisfactory that orders have recently been placed with the Western Electric Company for complete telephone and selector equipment on the two new divisions.

The officials of the road are reported to be well pleased with the new method of handling train movements. They are planning to push the work of equipping their entire system with telephones and selectors.

Telephone Meeting in Indiana.

The eighth annual meeting of the Delaware and Madison Counties Telephone Company was held at Anderson, Ind., on February 21.

The report submitted to the convention contained some interesting facts regarding the connections of rural lines with the company exchanges. The report shows a remarkable increase in business.

Officers for the coming year were elected as follows: President, George W. Beers, Ft. Wayne; vice-president, W. H. H. Juriek, Anderson; secretary, W. E. Hitchcock; treasurer, T. F. Rose, Muncie. S.

International Congress of Telephone and Telegraph Engineers to Meet.

At the Paris, 1910, International Congress of Telephone and Telegraph Engineers, the following subjects will be discussed:

(1) Manual versus automatic systems of telephone working.

(2) (a) Simplification of telephone circuits; (b) selection of frequency and secondary potential (for purposes of theoretical investigation) with a view to facilitating the approach of the telephone current to the sine wave-form; (c) the circumstances conditioning the adaptability of telephone apparatus to the lines, induction coils, microphone resistance, etc.

(3) Precautions to be taken for the avoidance of mutual disturbance in the case of power circuits running in close proximity to telegraph and telephone lines.

(4) Telephony between places at great distances from each other. Construction of cables for long-distance use, relays, combination of aërial lines with cables.

(5) Wooden poles—new process for impregnation and preservation—and procedure described from actual practice as to staying and strutting.

(6) Party lines and selective calling upon telegraph and telephone lines.

(7) Telegraph systems for heavy traffic. Multiple type-printing telegraphs and the Mercadier system.

Indiana and Michigan Telephone Men Meet in Joint Convention.

The executive committees of the Indiana and Michigan Independent Telephone Associations have effected an arrangement for holding a joint convention in South Bend, Ind., May 11 and 12. An excellent programme is being prepared and the joint convention promises to be notable and entertaining.

In a partial sense the telephone men from the two states will be the guests of the South Bend Home Telephone Company, and President Theodore Thorward is preparing to entertain royally. The headquarters will be at the Oliver Hotel and the joint sessions held in the Elks Hall. The officials of the international associations will attend and address the meeting. S.

McAdoo Tube Traffic Increasing.

In the month of January, this year, the Hudson River tunnels carried 4,150,169 passengers, an average of 133,876 a day, according to a statement issued recently. In February, which had three days less than the preceding month, 3,856,898 passengers were carried, an average of 137,746 a day. The February traffic shows a gross increase of sixty-one per cent over August, 1909, the first month of operation of the tunnels. The tunnels had their largest single day's business on Monday, February 28.

Chicago Electric Club.

"Postal Progress" was the topic of an interesting address delivered by John M. Hubbard, assistant postmaster, Chicago Post Office, at the meeting of the Chicago Electric Club on Wednesday, March 2, 1910.

Mr. Hubbard, who entered the postal service in 1871, recounted interestingly the many steps of improvement which the service has undergone during his connection with it. He told of the organization of the department when the postoffice building was on the site now occupied by the First National Bank Building. Less than 100 clerks were employed then while the number now is more than 3,600. The old methods of handling mail matter were compared with the methods now in use both inside and outside of the office.

The receipts of the Chicago office have grown in proportion to the advancement in the method of handling the mail. Mr. Hubbard said that in 1871 the total receipts amounted to about $500,000 while during the past fiscal year the receipts were $16,000,000. The receipts of the Chicago Post Office are equal to more than one-twelfth of the entire amount received by the United States postal department.

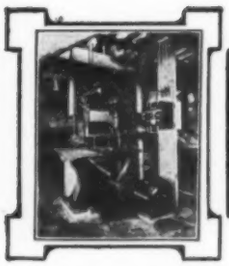
Other statistics presented by the speaker shows that 700 tons of mail matter pass through the post office daily. Over 2,500,000 pieces of mail are cancelled daily and the majority of this mail is received at the office between the hours of 4 P. M. and 7 P. M.

Mr. Hubbard spoke favorably regarding the establishing of a more far-reaching system of civil service, which would include every person in the department except the Postmaster General.

The value of co-operation between business houses and the postal department was emphasized and Mr. Hubbard asked for the support of the electrical men in bettering the service.

Norway Buys Submarine Cable.

The Norwegian Storthing has voted the sum of 1,104,500 kroner (over $300,000), a part of which will be used for the purchase of the Great Northern Company's cable between Egersund and Peterhead, and Arendal and Hirtshals. The rest of the money will be used to finance the construction of a cable between Arendal and Newcastle-on-Tyne (England).



Industrial Power

AN ELECTRICALLY OPERATED SAWMILL.

A UNIQUE PLANT IN WISCONSIN.

What is believed to be the first sawmill in this country, if not in the world, entirely operated by electricity, has been completed by the C. A. Goodyear Lumber Company, of which Lamont Rowlands is manager, at Tomah, Wis., and has been in successful operation since the tenth of last November.

August H. Meyer, of the Langstadt-Meyer Construction and Supply Company, of Appleton, Wis., designed and built the power plant, which is not only a new departure in sawmill engineering, but is a model of its kind. It was the aim of the designer to build a plant that would not only be economical in operation, but that should also be subject to a minimum of shutdowns, and the fact that up to the present the mill has not been shut down for an hour for repairs to the power plant is sufficient testimony to the success of the designer in this respect.

There are some sawmills, notably in the South and West, that are using electric power to drive a portion of the plant, particularly such machinery as was difficult to reach by line shafting. Considerable difficulty was experienced with some of these installations due principally to faulty wiring and improperly selected motors, and trouble was the result. An electric drive throughout was thought to be impracticable owing to the heavy starting duty required of certain motors, especially of those driving the band saws. It has been proven that motors of the proper type judiciously selected for the particular duty required of them will do their work far better than the old-fashioned line shafting and belting, will materially reduce the fire hazard, and incidentally the insurance rate, give a light, clean and roomy mill, thus reducing the liability of accidents to employees, and will be subject to a minimum of shutdowns because of hot boxes and broken belts and shafts.

The ease with which extensions to the plant can be made is by no means the least important feature of the motor drive. The speed of the entire mill does not fall when a particularly heavy cut is taken by some saw, and better lumber is the result. A breakdown of any portion of the plant does not necessitate a shutdown of the entire mill, as the motors are all independent of each other, and any portion of the plant can be run after hours to catch up with its work, should occasion demand, without running the entire mill idly.

As this plant furnishes power for city lighting, it is run continually, and the problem of storing fuel (hog product and sawdust) to tide over the times when the saw mill might be shut down, was most important. The difficulty was solved by building a brick storage house, twenty-six by seventy feet, adjacent to the boiler house, with a system of V-shaped hoppers at the bottom of which are conveyor chains which can be started singly. These chains deliver the fuel to the main conveyor which in turn delivers it to the boilers. Enough fuel for about four days' run can be thus stored.

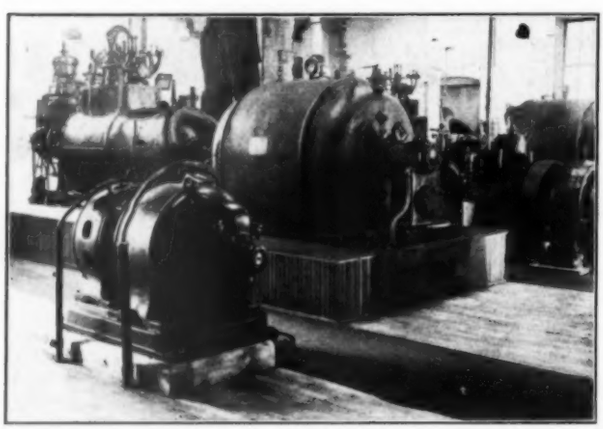


FIG. 1.—VIEW IN ENGINE ROOM, SHOWING TWO 300-KILOWATT WESTINGHOUSE PARSONS TURBINES.

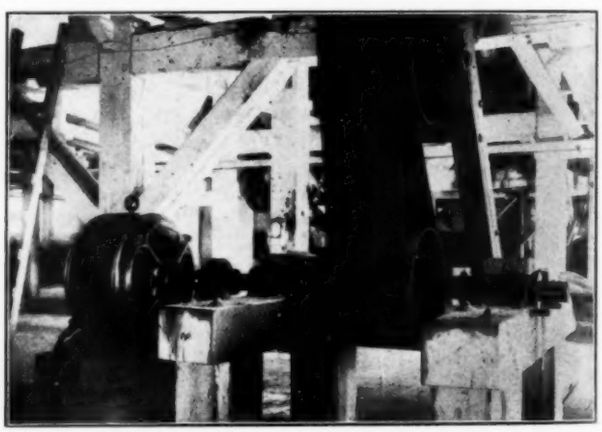


FIG. 2.—FIFTY-HORSEPOWER MOTOR DRIVING SAW EDGER.—MOTOR CONNECTED TO JACKSHAFT BY FLEXIBLE COUPLING.

Two Lyons safety boilers, of 550 horsepower each, furnish steam at 150 pounds pressure for two three-phase, sixty-cycle, 440-volt, 300-kilowatt Westinghouse Parsons steam turbines, which are operated condensing, the water for the condenser being taken from the mill pond by a motor-driven centrifugal pump. The circulation of the condensing water in the pond keeps it from freezing in severe weather. Space is left in the engine room for an additional unit, should this latter be required. Exciting current can be furnished either by a motor-generator set, or by a direct-connected steam-driven exciter.

Power for the sawmill, planing mill,

and city lighting is furnished from this plant, three fifty-kilowatt step-up transformers being sufficient for the city incandescent lighting, the fifty-four arc lights being supplied by a constant-current regulating transformer connected directly to the busbars at 440 volts.

The planing mill is located at a distance of approximately 2,000 feet and is driven by a single 150-horsepower induction motor. This planing mill is to be replaced by an entirely new mill in the near future, and each machine will then be equipped with an individual motor.

Twenty Allis-Chalmers motors ranging from ten to 150 horsepower are required to drive the sawmill. With but few exceptions these are directly belted or direct-connected by means of flexible couplings to the driven machinery. For the sake of economy and convenience, some of the conveyors, transfer tables and live rolls are grouped.

Considerable doubt was expressed regarding the ability of a motor to start the heavy eight-foot band mills without using a motor of excessive capacity with its attending evils, because of the great inertia of the heavy band wheels. This purpose was accomplished, however, by using a 150-horsepower wound-rotor motor which brings the saw up to its full speed in about two minutes, and starting slowly to allow the sawyer to adjust his machine. Absolutely no difficulty in starting was experienced, and the motors have ample reserve power to drive the saws through the heaviest frozen hardwood logs. Two sixty-two-inch McDonough horizontal resaws are each equipped with a seventy-five-horsepower wound-rotor motor. All of the other motors are of the squirrel-cage type, and no difficulty in starting is encountered.

In order to ease the strains in the motors incidental to starting the saws in a heavy cut, the larger motors are direct-connected to a short jackshaft by means of a flexible coupling. The pulley on this jackshaft is then belted directly to the saws to be driven, an idler being used to keep a proper belt tension. This method of belting from a jackshaft was found to be very satisfactory as all of the strains are taken off the motor shaft by the jackshaft, and the motor bearings have to carry the weight of the rotor only.

Fig. 7 shows one of the 150-horsepower motors, flexible coupling, and jackshaft connected to an eight-foot band mill, and Fig. 2 shows the same method as applied to a six-saw edger, while Fig. 3 shows a motor direct-connected to the slasher shaft.

Some very interesting tests were made on each of the motors in this plant by means of a curve-drawing wattmeter, to determine the actual amount of power developed by each motor and the load peaks, and very valuable data for future installations

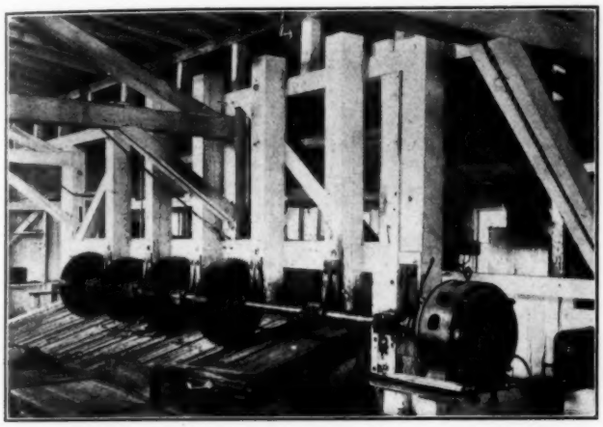


FIG. 3.—SLASHER DIRECT-CONNECTED TO TWENTY-HORSEPOWER MOTOR THROUGH FLEXIBLE COUPLING.

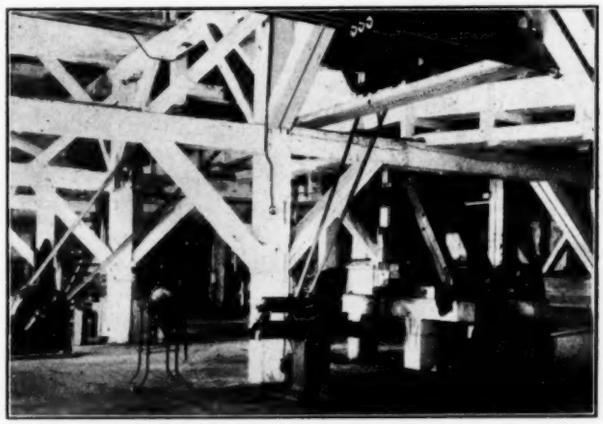


FIG. 4.—A ROOMY, CLEAN AND WELL-LIGHTED GROUND FLOOR—NO SHAFTING OR BELTING.

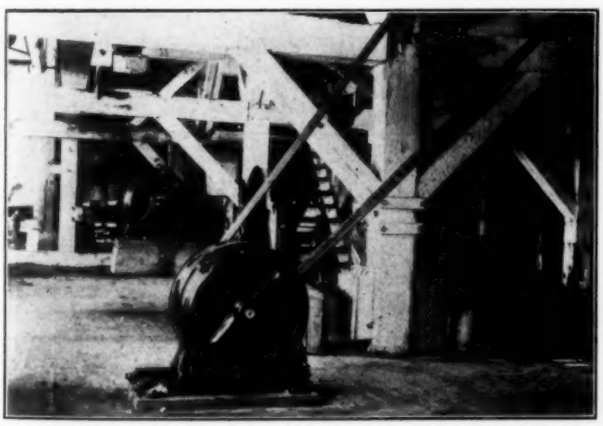


FIG. 5.—THIRTY-HORSEPOWER MOTOR IN FOREGROUND, DRIVING TRANSFER TABLES, ROLLS, AND CONVEYORS. MOTORS IN BACKGROUND (150 HORSEPOWER), ON BAND MILLS.

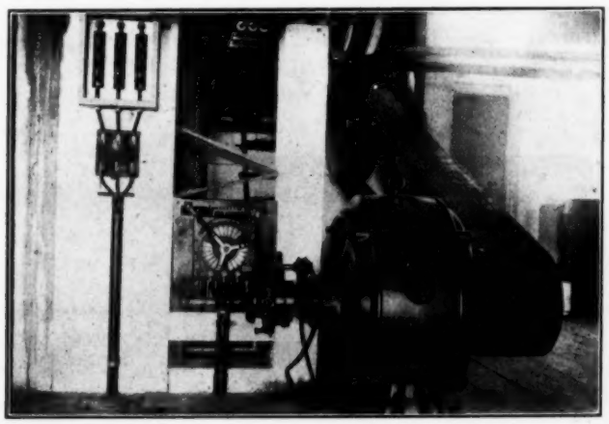


FIG. 6.—SEVENTY-FIVE-HORSEPOWER WOUND-ROTOR MOTOR, DRIVING SIXTY-TWO-INCH McDONOUGH RESAW AND LATH MILL.

of a similar nature have been obtained. Fig. 10 shows a few of these curves that are very interesting. The first curve is a record taken on a six-saw edger during a five-hour run on mixed timber, mostly hemlock and birch. The straight horizontal lines represent divisions of five kilowatts each, and irregular lines at right angles to these, show the fluctuations of the load. It will be noted that the load is very irregular, and runs to high peaks, throwing momentary overloads on the motor as great as 100 per cent. The capacity of this motor is forty kilowatts and the motor is running at practically full load all of the time. The peaks being of short duration do not have a serious heating effect.

On the second curve, the straight horizontal lines represent divisions of two and one-half kilowatts each. This curve was taken on a motor direct-connected to a four-saw slasher, the motor having a capacity of fifteen kilowatts. On this motor the load fluctuates to even greater peaks than on the preceding curve, reaching a momentary overload of 150 per cent, though the average load of the motor is slightly less than its rated capacity.

The third represents the load on a motor of fifteen kilowatts capacity driving transfer tables and live rolls. The horizontal lines also represent divisions of two and one-half kilowatts each. This is a comparatively steady load, having but few peaks, and these of minor importance. It will be noted that this motor is carrying only a trifle over half its rated load. These curves illustrate the importance of properly designed equipment.

The wiring for motor circuits is a combination of open and conduit work, and a special effort was made to have the cables of proper size to carry the starting and overload currents with a minimum of loss. All open wiring is supported on and protected by three-inch plank runways, and conduit was used where exposed to moisture or possibility of injury.

The plant of the C. A. Goodyear Lumber Company has attracted widespread attention, and the excellent results obtained will encourage the building of electrically operated plants.

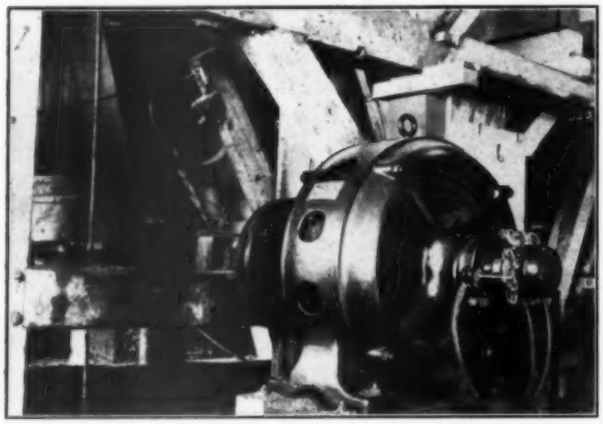


FIG. 7.—150-HORSEPOWER MOTOR DRIVING EIGHT-FOOT McDONOUGH BAND MILL.

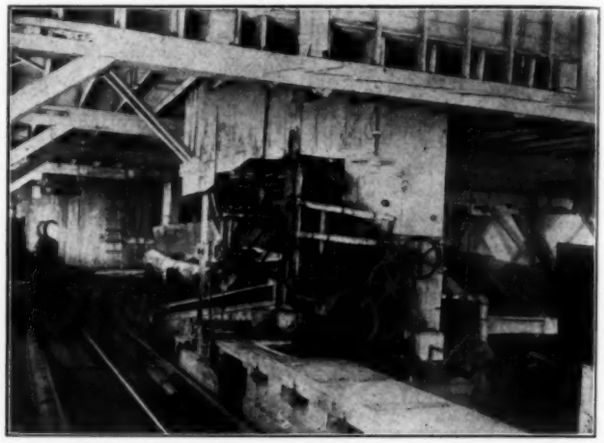


FIG. 8.—EIGHT-FOOT McDONOUGH BAND MILL DRIVEN BY A 150-HORSEPOWER MOTOR.

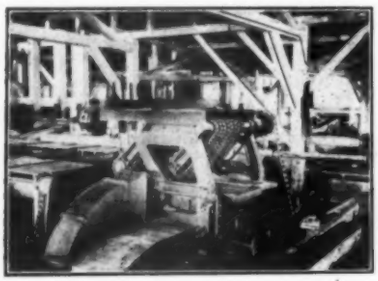


FIG. 9.—HORIZONTAL RESAW DRIVEN BY SEVENTY-FIVE-HORSEPOWER MOTOR.

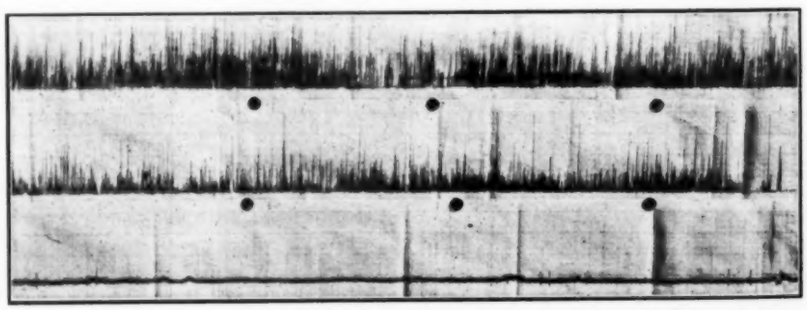


FIG. 10.—CURVE-DRAWING WATTMETER CHARTS, SHOWING LOAD ON MOTORS DRIVING EDGER-SLASHER, CONVEYORS, AND ROLLS, RESPECTIVELY.

British Torpedo Works Adopt Electricity.

The British Admiralty, in removing its torpedo works from Woolwich, London, Eng., to a site near the River Clyde, in Scotland, has decided to make a most extensive use of electricity for lighting and power purposes. The new works will open in May next, according to present plans, and it is confidently predicted that the electric drive will considerably accelerate the output of the shops.

Prefers Three-Phase System for Mines.

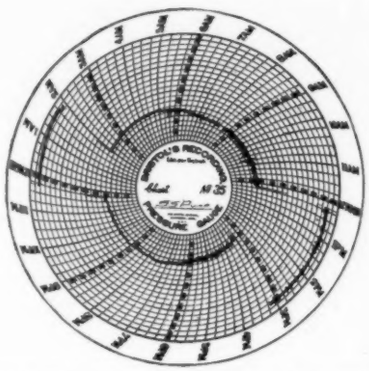
In a paper read before the Mining Society of Birmingham (Eng.) University on January 27 last, Robert Nelson, the British Electrical Inspector of Mines, favored the three-phase system for electrical mining installations. Although, for the same pressure, direct-current cables cost thirty per cent less than those for three-phase supply, yet on account of the difficulty of obtaining sparkless commutation with direct-current at high pressures, the three-phase system actually proved cheaper as regards capital cost of distribution.

ELECTRICALLY DRIVEN PUMPS—X.

AUXILIARY PUMPING STATION AT CHARLESTON, W. VA.

The following description of an auxiliary pumping station at Charleston, W. Va., by George F. Maddock, is taken from a recent issue of *The Engineering Record.*

A section of the city of Charleston, W. Va., known as the South Side, is located on a bluff between 200 and 400 feet above the city proper. It is supplied with water through an independent distribution system from a standpipe located on the highest point of this section. This standpipe is sixteen feet in diameter and forty feet high, set on a concrete foundation and well braced by iron rods to resist wind pressure when it is empty. Water is supplied to this tank through an auxiliary pumping station located about 1,800 feet therefrom, and at an elevation 400 feet below the tank.

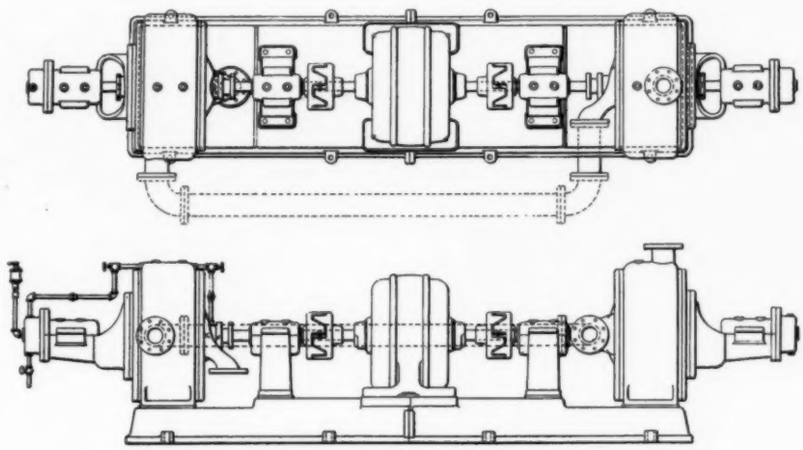


TYPICAL CHART FOR PRESSURE GAUGE.

There is but one pumping unit, which consists of two, two-stage, three-inch centrifugal pumps connected in tandem, and operated by a twenty-horsepower Westinghouse two-phase 220-volt induction motor, controlled by an automatically operated rheostat through a float switch located on the standpipe. The effect is the same as a motor-driven four-stage centrifugal pump.

Water is supplied to the pump at an average pressure of sixty pounds, through a six-inch main about 900 feet long crossing the Kanawha River, and 500 feet of four-inch pipe from the river bank to the pump. At the pump suction the four-inch pipe is reduced to three inches, and a cone screen inserted between two flange couplings to collect foreign material and prevent stoppage of the runners. The water is discharged through a three-inch water meter, a check valve, and a four-inch steel screwed pipe line 1,800 feet long into the bottom of standpipe, and is elevated 400 feet.

A Bristol recording pressure gauge is located on the discharge end of pump, and a chart is taken of the discharge pressure each day. This is for the purpose of keeping the superintendent continuously advised concerning the condition of the pump. When the pump is not operating the pressure shown on the chart is that of the supply main, and when operating the chart indicates the discharge pressure. Used in connection with the readings of the electric and the water meters the chart indicates the condition of the distribution system and the pump at all times. An outline drawing of the pump is shown herewith, together with a chart from the recording pressure gauge.



VIEWS OF PUMP IN AUXILIARY STATION, CHARLESTON, W. VA.

The station is operated automatically by means of the float switch and rheostat, and the former may be set to start the pump at any desired water elevation in the standpipe. A boy, one of the company's office force, visits the station each morning, oils the bearings, tests the running condition of the motor by starting it with a test switch, reads the water and electric meters, and changes the pressure chart on the Bristol recording gauge. The total time occupied by this boy is not more than half an hour from the time he leaves the office until he returns.

The pump house is a fireproof brick building with concrete roof, and covers a ground area of ten by twenty-five feet. All of the pumping machinery was supplied by the Buffalo Steam Pump Company, of Buffalo, N. Y.

(To be continued.)

Electric Motors in Breweries.

Since motors have been protected from water by casing them, their use in German breweries has become common, and is rapidly increasing, says *The Electrical Engineer*, of London, Eng. One of their main functions is to drive the pressure regulator which forces the beer through the filters into the casks in which it is despatched. A very interesting type of these machines is a cog-wheel pump coupled direct to the motor. Variations in pressure cause variations in the resistance of the motor circuit, so that the least change is at once checked and the beer travels steadily and without frothing. Another type has horizontal beer cylinders, and pressure is maintained constant by two cylinders fitted with suitable valves and containing air or water under pressure. The power of the motor is best transmitted by friction coupling, as belts are apt to get slack in the moist air of a cellar. The power transferred to the pumps from the motor by friction is transmitted by toothed gearing to the cranks of the pump cylinders. The motor should be provided with a controlling resistance, which is adjusted daily according to the work expected. Another job which may be advantageously given to the motor is to drive the stirrer in washing the filtering material above alluded to. This requires frequent washing by being stirred up in water kept boiling by a steam coil or by direct steam.

A New Movable Coil Galvanometer.

The fact that the mirror galvanometer always has to be set up exactly according to the spirit level makes its employment outside of the laboratory inconvenient. A new instrument, which does not possess this drawback and is still sufficiently sensitive is described by M. Mohs. From Fig. 1, which diagrammatically illustrates its construction, it will be seen that a suspended system has been chosen, but the undesirable properties of suspended systems have been avoided by a novel arrangement. The fine metal wire or band *d* carrying the coil is connected with the same at *b*, while its other end is fastened to the bridge at *a*. Thus, in contra-distinction to the suspended systems so far known, the point of suspension is not above but below the center of gravity of the coil. This arrangement permitted the use of a relatively long suspension band without increasing the height of the entire instrument. In order to prevent the coil from tilting, its frame is connected with a bent arm ending in a fine steel point, which plays freely in a bearing above a. For a better centering of the system the metallic piece to which the suspension band is attached below, also ends in a point, likewise surrounded by a ring bearing. The point and jewel bearings do not carry the frame, but serve only for preventing it from tilting and swinging; the coil is held entirely by the suspension band and no appreciable friction is therefore caused by the bearings. On account of the long suspension band no disturbing elastic after-effects are caused by large deflections of long duration. The object attempted in the construction of this instrument, namely, to make it independent of careful setting up in a horizontal plane, has been completely attained. Inclinations of the galvanometer up to about ten degrees are not detrimental to the free movement of the coil, so that measurements may be made even while the instrument is held in the hand. The new galvanometer is manufactured by the Hartmann & Braun Company of Frankfort on the Main.—*Abstracted from Physikalische Zeitschrift, Leipsic, January* 15, 1910.

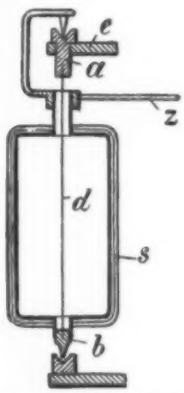


FIG. 1.—DIAGRAMMATIC VIEW OF MOVABLE-COIL GALVANOMETER.

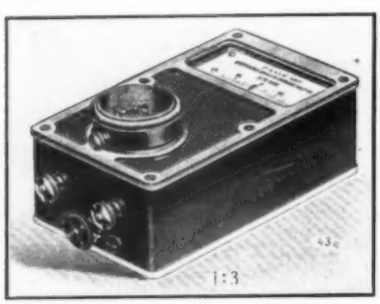
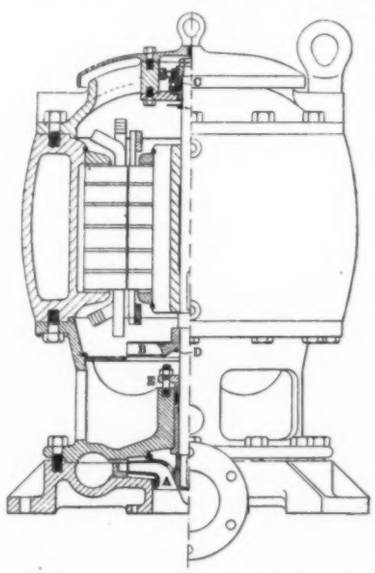


FIG. 2.—PERSPECTIVE VIEW OF GALVANOMETER.

A Self-Contained Electric Pump.

A self-contained electrically driven pump which possesses some unique features of design is the subject of a British patent recently issued to A. B. Malinson, of Prestwich, Manchester, Eng. The pump is of the vertical motor-driven centrifugal type, and is shown in the accompanying diagram. The motor casing and the body of the pump are rigidly connected together, and the pump wheel and the motor armature or roter are mounted on one shaft. In the illustration, *A* is the impeller, *E* the pump gland, through which the shaft passes, the upper end of the shaft being carried in *C*, a ball bearing fitted in the top cover of the motor. This cover has openings to permit the egress of air, while a cap placed above prevents the entrance of water which may fall on the outside. The open spaces in the extension of the pump body may be covered with wire netting. A fan *B* causes a current of air to be drawn in through the lower openings over the cold body of the pump. The air is thus cooled, and then blown through the motor armature and field windings, escaping out of the top openings. The under side of the hub of the fan *B* is provided with a suitably shaped annular disk *D*, which will check and throw off any water which may issue from the pump gland *E*.



SELF-CONTAINED ELECTRICALLY DRIVEN PUMP.

Magnetic-Insulating Properties of Enamel.

A recent report from Germany, via an English source, states that Herr R. Gaus has discovered that wire insulated with a coating, a certain kind of enamel, is practically insensitive to a magnetic field, and that a research is being made with a view to discovering the kind of enamel that will give the best insulation from magnetic lines of force. Hitherto there has been no substance known that will at the same time serve as an insulator both to electric current and to a magnetic field, and it is stated that if the new double insulation proves a success under exhaustive and practical tests, it will cause almost a revolution in the design of many kinds of electrical apparatus, especially measuring instruments of precision.

The Brussels Exposition.

The official opening of the fifth international exposition of Belgium, to be held this year at Brussels has been set for April 23, and already the decorations and appointments of the main buildings are nearing completion.

A large number of countries will be officially represented at the exposition which promises to surpass all previous ones held in that country.

The exhibition includes twenty-two divisons among which the following may be mentioned as having a direct bearing on engineering: Scientific instruments and processes; mechanical art; electricity; civil engineering.

ELECTRICAL Advertising *and* Selling

HIGH EFFICIENCY LAMPS AND CENTRAL-STATION ADVERTISING.

BY CHARLES A. PARKER.

What shall be the attitude of central-station advertising toward modern high efficiency lamps? What policy shall be adopted in regard to these various types of improved incandescent lamps which by their very nature are apparently destined, if they come into anything like universal usage, to reduce receipts and render unproductive many dollars worth of equipment that is necessary at present to meet the demand? No question could be raised that would be more timely than this, and no question is so urgently demanding an answer.

It is no exaggeration to put the matter as strongly as we have for, looking at the situation at its broadest and most fundamental aspects, we shall see that the whole future prosperity and growth of the central station hinges upon the adoption of a broad-gauge attitude and policy toward modern electrical improvements.

It would be a simple enough matter if, these improvements being made and these lamps being manufactured, it were left entirely to the central station to say whether or not and to what extent they should be introduced and pushed.

But such, unfortunately, is not the case. On the one hand is the lamp manufacturer with a new product as far superior to the ordinary carbon lamp as that lamp is to the candle. On the other hand is the consumer with a well-developed and heart-felt longing for the very qualities embodied in these new high-efficiency lamps. The customer wants more light, better light, and cheaper light. The lamp manufacturer is able to give it to him and anxious to do so. Both are utterly oblivious to the "poor" central-station man whose income is apparently threatened and a large part of whose equipment, built to fit a far less economical lamp, is seemingly bound to fall into disuse. (Mark the words apparently and seemingly. Their significance will be appreciated later on.)

The situation is complicated by two facts which cannot very well be ignored. In the first place, lamp manufacturers are not showing a disposition to rest content with inventing and manufacturing improved lamps. They are developing a very keen eye for the main chance and are by no means "hiding their light under a bushel." One can easily predict that if the central station keeps its patrons "in the dark" regarding better light, more light, and cheaper light, the manufacturer or his agents will not be slow to step in and fill up the gap. This brings us to the second fact we have mentioned—namely—the live interest being shown in every quarter for improved illumination. This is an era of dissatisfaction with everything but progress and improvement. Only one excuse would ever prove acceptable for standing still—and that would be the complete attainment of ultimate perfection. Needless to say, it will be some time before this excuse will be available to central stations. But, seriously speaking, the public is showing an active interest in electrical progress and would certainly resent any effort to curtail or postpone its enjoyment of anything that modern electrical science has made possible. This, in general, is the situation at present.

It is the purpose of this article, without pretending to settle the matter for each individual central station, to point out that this is a problem to be solved by first adopting the proper policy in the matter and then by following it out with a judicious advertising campaign.

High efficiency lamps that give an increased amount of purer light for a smaller consumption of current per unit of light secured are the order of the day. They are absolutely certain to come into their own—any central station, standing as it believes in staunch defense of its exchequer to the contrary notwithstanding. Do not mistake the writer by believing that he, for his part does regard Mazda and tungsten lamps as real live and permanent menaces to the corporate purse. He does not. He is merely assuming for present purposes, that high efficiency lamps are, as many central stations believe, sources of justifiable concern.

With this assumption, the advice of this article still remains the same. Acknowledge the merits of high efficiency lamps. More than this promulgate the fact by means of advertising and assist those who would have them, to getting everything out of these modern lamps that there is in them.

Any attempt to minimize the virtues of high efficiency lamps or to expose any real or imagined drawbacks would be the most effective advertising you could possibly give them. The motive would be altogether too evident. The man reading the knocking would reason something like this: "What is this lamp any way that the lighting company is roasting?" Then—if he didn't know something about it already—he'd nose around until he bumped into the fact that it gave as much light as his carbon, using one-half or one-third the amount of current.

Can you imagine his kindly feelings toward the central station as he goes down to some lamp agency to buy "good lamps?"

Far too many central stations fail to recognize the fact that silence and inactivity are equally as dangerous as actual opposition and much more subtle. Our meaning here can best be shown by a consideration of what, in the writer's estimation, constitutes the real and only danger to the central station from "high efficiency" lamps.

The whole matter revolves about the question of adjustment. There can be no doubt about it—if for every carbon lamp in a central-station's system a high efficiency lamp were substituted at one and the same time, the central-station's income would take a decided slump and much of its equipment rendered useless. Give the central station time to adjust itself to the changes that naturally fol-

1 The fifth of the present series of articles on "Central Station Advertising" appearing in the second issue of each month.

low in the train of the improved incandescent and not only will these same incandescents not be a menace but, on the contrary, they will be a powerful factor for eliminating about ninety-nine per cent of the central-station man's troubles, and at the same time bring in new business and increasing profits all along the line.

The history of every great improvement ever made demonstrates this to be a fact. In cases where some revolutionary invention has been made and universally adopted, the workers affected have suffered acutely for a time. But as matters gradually swung around, it has invariably been the case that, in spite of the labor-saving qualities of the invention, more workers were able to find employment in the same line of business and under better conditions.

Consider for a second the so-called "Industrial Revolution" occasioned by the original introduction of machinery into the factories of England. Who would have dared to predict in the face of those howling mobs of starving hand workers that, if they would be patient the very machines which took away their employment would soon return it together with places for additional thousands. But such certainly was the case.

Sewing machines, typewriters, automobiles, printing presses, type-setting machines, all have a similar history except in those cases where the change from the old to the new was made so gradually that all parties concerned had ample opportunity to adjust themselves to the new order of things.

Now then if the central station deems it the part of wisdom to maintain a discreet silence wherever high efficiency lamps are concerned, it will have no control over the rapidity with which its patrons substitute the new lamp for the less desirable carbon. And if the central station would avoid the unpleasant "shock" of a too sudden change, it must be the master of the situation in its own particular field. Besides, is it not reasonable to suppose that the central station, showing a disposition to "get in the procession" and push, will find the lamp company of its choice ready to aid it in its work leaving the greater part to it? Another fact also does much to give the central station the whiphold in the matter if it comes out flat-footed for electrical progress;—other things being equal, its patrons will turn to it rather than to favor that "municipally-owned" lighting plant that crops up every so often.

There can be no doubt about it. To be certain of avoiding the one danger involved in the introduction of high efficiency lamps and to secure all the benefits that might possibly accrue from them, the central station must be master of the local situation. Knocking will certainly do anything but accomplish this end. Silence is equally ineffective. So again—"Take the bull by the horns. Acknowledge the merits of high efficiency lamps. More than this, promulgate the fact by means of judicious advertising. Assist those who would have them to getting everything out of these modern lamps that there is in them."

WHAT HIGH EFFICIENCY LAMPS HAVE FOR THE CENTRAL STATION.

It is easy enough to see the reasonableness of the objection the central station may advance to a sudden and complete change from carbon incandescent to modern high efficiency lamps. It is not so easy, at least for the person unacquainted with the lines along which the use of electricity for illuminating works itself out, to see that in the long run the high efficiency lamp is going to prove a blessing to the central station and not a curse.

Probably the reason can be most readily appreciated by contrasting electric light as a commercial commodity with ordinary articles of daily use. People are using flour every day. They consume as much as they need and possibly waste a certain amount. Now suppose by some wonderful process, it were made possible to get two or three times as much bread from a barrel of flour as it was before. It would not follow that the general run of people would eat two or three times as much bread as they had previously. One barrel would be made to last two or three times as long and the grocer could whistle for his profits.

But artificial light is another proposition altogether. A man does not use so many units of light because he needs so many units to satisfy his particular requirements. He uses the amount he does because that is as much as he thinks he can afford or as much as man's knowledge of artificial illumination will permit. There was a time when the wealthiest epicures who ever suffered from gout had nothing more than candles to light their banquet tables. People are not going to lessen their expenditure for light simply because they can get the amount they are now using for less money. They are going to use more light, and the increase in the amount used will probably be at a greater rate than the decrease in the cost per unit. This may seem like a mere assertion until one glances at the psychology of the thing. People are more free in their use of things of a low unit cost than they are in the use of things of a higher unit cost.

Take the storekeeper for instance. He does not say: "How much will it cost me to light my place?" but "I have so much to spend for light, what can I get for it?" And then, finding that he can get more than was formerly possible, he will go ahead and spend more than he anticipated without a murmur. With carbon illumination, he did not hesitate to turn off the light when a customer left the third floor or to prolong the hours of daylight into dusk before lighting up. With high efficiency lamps, he says better light than ever before and it only costs me a third as much.

No central-station man of experience will deny this tendency of lighting bills to maintain its level in spite of conditions, and no central-station man of experience will deny that the satisfaction engendered by the merits of high efficiency lamps is worth a good deal to him.

But even this aspect of the matter is dwarfed by another phase, and that is the effectiveness of high efficiency lamps as a whip to round up new business. The writer can only conceive of one reason that anybody could legitimately give for not using electric light, and that is its cost. It does not take much imagination to see large volumes of new business flowing into the central station in answer to the clarion call of advertising that announced "Electric light is now cheaper." Back this up by the announcement that it is better light, whiter, lighter and practically day-light and there is good reason for believing that high efficiency lamps will if anything compel the central station to add to its facilities rather than allow any of them to become idle.

In view of all this preceding discussion, does it not look as if the logical attitude for the wise central-station manager to assume should be one of enthusiasm for the new types of lamps and

as if he should seek to control the situation and profit by it through judicious advertising?

THE JUDICIOUS ADVERTISING OF HIGH EFFICIENCY LAMPS.

What is meant by judiciously advertising high efficiency lamps? This is the point about which our discussion must revolve from now on. Any analysis of the matter that will leave a clean cut impression must begin with the objects to be accomplished.

As nearly as the writer can judge, these are three in number all of which are of no little importance, the last being probably the most vital. First, this advertising must seek to create confidence in the company's good faith and a general belief in its readiness and anxiety to give its patrons the benefit of every new improvement possible. Second, this advertising must seek to bring into the "electrical fold" (by means of the arguments offered by high efficiency lamps) all those who have hitherto resisted every effort, and third, this advertising must seek to control and regulate, but not unduly retard, the adoption of high efficiency lamps by customers in such a way that the central-station's income and equipment are not interfered with. If your advertising accomplishes these ends, it is judicious.

Of course here, as in previous articles, the writer is compelled to confine himself to a few fundamental generalities in the hope that they may be a source of suggestion and assistance to the central-station advertiser seeking to avoid too sudden a change on the one hand and "lost control" on the other.

Our outline of the work to be done cannot but suggest the one logical classification of the people to whom our advertising must go, users and non-users. It is the first class that requires diplomatic handling.

You, by all means, want to avoid a "rush" but you certainly do not want them to know it. You are perfectly willing to have them all come in provided they do not all try to come in at once.

To this end, your advertising should invite not immediate action but rather inquiries. It should aim to satisfy curiosity that has been aroused by anything your people have read or heard rather than to arouse desire. Then when you do receive inquiries you should have matter ready—booklets, etc.—which will tell in a clean-cut, straightforward manner the story of high efficiency lamps. This sort of advertising will accomplish two things for the central station. It will make your people look to you and not elsewhere for improvements in electrical illumination and it will bring changes about so gradually that you will have plenty of opportunity to adjust yourself to them.

There are, however, certain classes of users, large classes in fact, who do not need to be handled in this diplomatic manner. Store and sign people for instance. Store illumination and sign illumination is regarded by the merchant, or at any rate should be regarded, not as an expense, but an investment. Now do you suppose he is going to lessen that investment if you show him that the new lamps increase the trade pulling power of his illumination two or three times for the same money? As the writer has already suggested the fact that, the unit cost of his light being cheaper, the merchant is going to spend even more than he did before for it. Here then is a class of consumers that it will pay to go after as hard as you can. So also with wealthy users of current. On the principle we have already suggested, they are not going to burn less current but rather more.

Outside of these two classes, the others need occasion but little worry if central-station advertising proceeds judiciously along the lines suggested. Users will not fall over themselves to get in line so fast that the central station cannot take care of them provided it maintains its control over the situation.

In conclusion the greater menace connected with the whole situation is the menace that threatens those central stations which by their silence are really opposing the introduction and widespread adoption of high efficiency lamps. If they do not adjust themselves to new conditions now what are they going to do in the future when the disparity between the carbon lamps will be much greater than it is at present, when lamps are invented that will be—not two or three times as efficient as carbons—but perhaps ten or twelve times as efficient, and when these same lamps do away with the fragility, comparatively high cost and other drawbacks of modern tungsten lamps?

Suppose a central station does succeed in keeping its people using carbons until these lamps arrive what will be the result?

The central station that adopts a broad-minded policy and pursues it constantly, keeping pace with progress need never fear for its future. Can you name a real genuine improvement in the electrical industry that has not, sooner or later meant better conditions and greater profits to all concerned?

Constructive Publicity.

A very interesting and instructive booklet has been published by the C. W. Lee Company, West Street Building, New York, devoted to constructive publicity for public utility corporations. This booklet raises the question with the public service corporation concerning its public policy, which can be either its greatest asset or its heaviest liability. The public policy that fosters the good will of the community constitutes an invaluable asset to any company. On the other hand surreptitious publicity breeds suspicion, inspired news, is always recognizable, and tainted news invariably taints the corporation in the mind of the public. The only kind of publicity that pays is honest publicity, plain statements of incontestable facts published over the name of the man of company responsible for it, and paid for as any advertising should be paid for. The booklet will be found interesting to those corporations interested in developing public policy along the lines of establishing friendly relations with the consuming public.

Window Lighting Campaign.

During the course of an energetic window lighting campaign in Philadelphia the central station of that city, the Philadelphia Electric Company, distributed among the merchants a folder which on account of its effective simplicity is briefly described herewith.

The dimensions of the folder are nine inches by fourteen inches. The stock is of an exceptionally good quality, light tan in color. When opened the upper half, nine by seven inches in size, presents to the recipient an excellent half tone reproduction of a modern store window scientifically illuminated.

As this illustration tells its own story the text on the lower half of the folder is therefore brief it being only necessary to explain how the results shown in the illustration were obtained.

On the outside cover is the slogan of the company: Electricity everywhere for everything in Philadelphia.

FINANCIAL REPORTS OF ELECTRICAL COMPANIES.

NASHVILLE RAILWAY AND LIGHT.

The Nashville Railway and Light Company has issued a report for the year ended December 31, 1909, which compares as follows:

	1909	1908
Gross	$1,724,380	$1,597,030
Expenses and taxes	1,013,883	954,297
Net	$ 710,497	$ 642,733
Interest	394,353	393,099
Balance	$ 316,144	$ 249,634
Depreciation	51,513	47,741
Surplus	$ 261,631	$ 201,891
Miscellaneous revenues transferred to profit and loss	.....	45,000
Surplus	*$264,631	$ 246,891
Preferred dividends	125,000	123,445
Surplus	$ 139,631	$ 123,446

*After allowing for seven per cent on $2,500,000 preferred stock, balance is equal to 3.49 per cent on the $4,000,000 common.

AMERICAN LIGHT AND TRACTION.

The report of the American Light and Traction Company for the month of January compares as follows:

	1910	1909
January gross	$379 274	$323,766
Expenses	¶ 501	8,834
January net	$370,773	$314,932

WEST PENN RAILWAYS.

The West Penn Railways Company has issued a statement of operations covering the year ended December 31, 1909, which compares as follows:

	1909	1908
Gross		$1,551,138
Expenses		859,264
Net	$786,575	$691,874
Charges	459,827	446,306
Surplus	$326,748	$245,568
Preferred dividend	137,500	137,500
Surplus	$189,248	$108,068

ILLINOIS TRACTION.

The Illinois Traction Company has issued its report for the year ended December 31, 1909, which compares as follows:

	1909	1908
Gross earnings	$4,752,082	$4,098,621
Operating expenses and taxes	2,749,069	2,345,124
Net earnings	$2,003,013	$1,744,497
Bond interest, etc.	1,250,429	1,220,537
Balance	$752,584	$523,960
Preferred dividends	259,146	217,116
Surplus for year	$493,438	$306,844

DETROIT EDISON.

The Detroit Edison Company reports for the year ended December 31, 1909, compared as follows:

	1909	1908
Gross	$2,199,143	$1,592,811
Operating expenses & taxes.	1,274,578	920,474
Net	$ 924,565	$ 672,337
Interest charges	511,702	428,649
Surplus	*$ 412,863	$ 243,688
Dividends	100,000	.....
Surplus	$ 312,863	$ 243,688

*Equal to earning 8.26 per cent on $5,000,000 capital stock outstanding.

MONTREAL STREET RAILWAY.

The report of the Montreal Street Railway Company for the month of December and three months ended December 31, 1909, compares as follows:

	1909	1908
December gross	$ 337,563	$ 304,885
Expenses	212,006	203,119
December net	$ 125,556	$ 101,766
Charges, taxes, etc.	34,480	30,726
December surplus	$ 91,076	$ 71,039
Three months gross	1,026,441	935,071
Expenses	586,879	549,195
Three months net	$ 439,562	$ 385,876
Charges, taxes, etc.	96,345	90,569
Three months surplus	$ 343,217	$ 295,307

KINGS COUNTY ELECTRIC LIGHT AND POWER COMPANY.

The Kings County Electric Light and Power Company has issued its full pamphlet report for the year ended December 31, 1909. The report includes the earnings of the Edison Electric Illuminating Company, of Brooklyn, as the entire capital stock of the latter company is owned by the Kings County Electric Light and Power Company. The combined earnings of the two companies, for the year ended December 31, 1909, compare as follows:

	1909	1908
Gross	$3,733,840	$3.613.470
Expenses and taxes	1,823,985	1,747,757
Net	$1,909,855	$1,865,713
Depreciation	430,260	404,857
Balance	$1,479,595	$1.460,856
Bond discount	20,269	24,783
Balance	$1,459,326	$1,436,073
Fixed charges	617,754	606,560
Surplus	*$841,572	$829,513
Dividends	800,006	$800,000
Net surplus	$41,572	$29,513
Previous surplus	†1,203,623	†1,178,061
Total surplus	$1.245.195	$1,207.574

*Equal to 8.41 per cent on $16,000,000 capital stock, compared to 8.29 per cent earned on the same stock last year.

†Less adjustment in 1908, $3,950; in 1907, $3,152.

President A. N. Brady says that gross earnings from commercial lighting increased 8.9 per cent, and from city, street and public building lighting 5.9 per cent. Total gross earnings increased 3.3 per cent. This reduction in general percentage is due to the temporary character of certain 1908 business, such as earnings of $163,932 from current sold for railroad and sewer construction work, and to the adoption by a large proportion of consumers of tungsten lamps which greatly cheapen the cost to the consumer of electric service.

After deducting all charges, including depreciation reserve items, bond interest and dividends, the net profit and loss surplus for the year is $41,571, as compared with $29,513 for 1908.

In continuation of its policy of giving the public the best service possible at reasonable rates, the company placed the tungsten lamps on favorable terms, and to offset the loss in revenue thereby from existing consumers relied upon the obtaining of sufficient new business. The response to the efforts of the company is shown by the following table:

	1909	1908
Number of consumers on Dec. 31	16,299	13,244
Total connections in 50-watt equivalents	1,772,357	1,546,498
Number of contracts	12,,494	12,998
Power in horsepower	11,506	10,841
Total light and power 50-watt equivalent	561,605	515,082

The increase of $60,645 in the replacement and depreciation reserve represents the difference between depreciation charges made during 1909 and cost of property withdrawn from service. The net credit in this fund, December 31 last, was $435,810.

The reserve account for unpaid special franchise taxes amounted at the end of the year to $522,538.

The plant and property account was increased $1,595,312 during 1909, $1,160,745 of which represents the net increase in plant, the difference having been charged to depreciation for replacement of property retired from service. This account is represented by property at fair and legitimate valuations, all of which is being kept up in first class operating condition.

During the year 1909 the company borrowed money from banks to the extent of $700,000, and issued notes therefore covering the cost of new construction, pending the capitalization of such expenditures.

President Brady, after mentioning the formal offering to shareholders of $2,500,000 debentures, closes with the expression of belief that the additional fixed charges will be easily provided for through increased earnings, and that 1910 will be a prosperous year for the company.

At the annual meeting of the Kings County Electric Light and Power Company and the Edison Electric Illuminating Company directors were re-elected.

MASSACHUSETTS LIGHTING.

The report of the Massachusetts Lighting Companies for the year ended December 31, 1909, compares as follows:

	1909	1908
Total net income	$840.646	$751,750
Operating expenses and maintenance	540,108	494,620
Net earnings	$300,537	$257,129
Interest charges	74,109	85,546
Net profits	$226,428	$171,583

AMONG THE CONTRACTORS AND SUPPLY MEN

To know what is going on among the men who do things and those who supply the material for the doing is always interesting. The actual happenings of the day with the contractors and the men who furnish them with supplies of all kinds, accurately reported from all parts of the country, is the object of this department.

ANDERSON & WATTS, of Rockville, N. Y., are installing the electric lighting system in the new Bates building at Lynbrook, N. Y.

FROST AND SHELDON, of Albany, N. Y., have finished the installation of electric lights in the Saratoga Battle monument at Troy, N. Y.

THE WHITEHALL ELECTRICAL COMPANY of Stonington, R. I., have completed the installation of electric lights in the residence of F. W. Coy.

C. D. STEWART, of Baton Rouge, La., has been awarded the contract for the erection of the $10,000 electric light plant building at Plaquemine, Iberville Parish, La.

HUBBS & JURGENSEN, of the Highlands, N. J., have completed the wiring of Chas. Carr's buildings at Red Bank, N. J.

M. B. FOSTER COMPANY, Boston, Mass., received the contract for the installation of all electrical work in the new municipal building. The bid accepted was for $21,235.

THE A. L. SWANSON COMPANY has been incorporated at Evansville, Ind., with a capital stock of $25,000. The incorporators are A. L. Swanson, J. B. Ramsey and Hannah Swanson.

THE DEAN ELECTRIC COMPANY of Elyria, Ohio, has been awarded the contract for installing a private telephone system in the Merrick Hotel at Paris, Texas. The contract was let for about $1,500.

YOST & YOST COMPANY, of Ossining, N. Y., has completed wiring the three residences of Divine & Sons, also the residence of James W. Donaldson for electric light. Tungsten lamps were installed throughout.

C. D. HODGE & COMPANY have been awarded the contract by the Oswegatchie Light and Power Company for developing the waterpower on the Oswegatchie River, near Hailesboro, N. Y. The work will involve the excavation of 8,000 cubic yards of rock.

THE LLOYD GARRETT COMPANY, of Trenton, N. J., has been awarded the contract for supplying the electric light fixtures for the new Freshman dormitories in Princeton University. The contract price is $3,500.

THE MANNING-LAWLESS ELECTRIC COMPANY, of Rochester, N. Y., was recently incorporated to engage in electrical contracting. The capital is $3,000, and the directors are: James Manning, Thomas F. Lawless and Thomas J. Lawless, all of Rochester.

THE JOSEPH FOWLER ELECTRIC COMPANY has been organized at Memphis, Tenn., by Joseph Fowler. The company will be equipped for doing all kinds of electrical work, wiring, etc. Mr. Fowler has been engaged in electrical work for the past fifteen years.

N. J. SMITH, of Long Branch, N. J., has been awarded the contract for wiring the A. J. Bach cottage at South Elberon. There will be about four hundred lights in the cottage and two or three hundred in the outbuildings. Posts along the driveway will be wired for electric lights.

CHARLES L. STAFFORD was awarded the contract to re-wire the Town Hall at Camden, N. J., and to bring the electrical appliances to conform to the requirements of the Fire Underwriters. Mr. Stafford will do the work for $105. The clerk was directed to advertise for sealed proposals to be received February 21 for furnishing 700 ferrules for water taps and 300 water meters.

THE STANDARD ELECTRICAL CONSTRUCTION COMPANY, of New Orleans, La., has been awarded the contract for installing electrical equipment in the Littlefield Building at Austin, Tex. The Littlefield Building is an eight-story theatre and bank building, and when completed will be the largest structure in Austin. The Standard Electrical Company is at present estimating several large contracts in Houston, where a number of new buildings are under way.

THE TRI-CITY ELECTRICAL SUPPLY COMPANY, of Moline, Ill., has been incorporated with a capital of $50,000 in the states of Iowa and Illinois. The promoters of the concern are also interested in the Tri-City Electric Company, which is in business in Moline and Davenport. The supply company will devote itself to jobbing business and the electric company will be confined exclusively to contracting. The latter concern employs about thirty men here and in Davenport. The directors of the new company are W. T. Ball, I. N. Butterworth, E. M. Kunkel. The officers are: President, W. T. Ball; vice-president, E. M. Kunkel; secretary, W. J. Ball; treasurer, I. N. Butterworth.

TUCKER & LAXTON, INC., of Charlotte, N. C., have received the contract for the erection of a complete lighting system for the city of Albemarle, N. C. The work will include the erection of between two and three hundred poles, the location of eleven arc lamps of latest and most approved pattern, fifty-two Tungsten lamps of sixty candle-power with metal reflectors, wiring, etc., comprising the town limits. The firm is under contract to complete the work by June 1.

National Convention of Inventors.

The International Congress of Inventors, a society for the mutual protection and advancement of inventors, will hold its first national convention and exhibition at Rochester, N. Y., from June 13 to 18.

This society was formed at Rochester in 1906 with the object of establishing a standing for United States patents, independent of any court action. In addition, the members are of mutual assistance in cases of patent infringements, etc.

The present convention will have exhibits of patents shown as products of inventive genius and also complete machines and devices exhibited for commercial publicity. Ralph T. Olcott, Rochester, N. Y., is secretary of the congress.

The 1910 American Exposition at Berlin Postponed.

There has been considerable publicity given recently to the attitude assumed by German manufacturers with regard to the American Exposition, which was supposed to be held in Berlin in 1910. In view of this attitude it has been suggested by the American Exposition Committee to postpone the exposition until 1911, and at that time make it an American-German Exposition if possible.

At the annual meeting of the West Penn Railways Company stockholders voted to form a new company, the West Penn Traction Company, with $5,000,000 preferred and $6,500,000 common stock, to take over the West Penn Lines, the West Penn Electric Company, the McKeesport & Greensburg Company and small concerns.

INDUSTRIAL SECTION

ILLUSTRATED DESCRIPTIONS OF NEW AND STANDARD ELECTRICAL AND MECHANICAL APPARATUS

The Central Station Development Company.

During the past three or four years there has been development in the use of publicity on the part of central stations for developing new business and in increasing the sale of electric current to old consumers. While this has gone a long way toward increasing the load in many localities and while some of the larger companies have established excellent departments for carrying on specific campaigns, an effort on the part of a number of companies has been sporadic, and has not produced the result which has been justified by the

E. J. KULAS.
President Central Station Development Company, Cleveland, O.

amount of money spent. One of the principal reasons why results have not been eminently satisfactory is because there has been a lack of coherent effort, which has militated against the cumulative effect which must be realized in order that any campaign may be attended with ultimate success.

The constructive features of the new business campaign call for ability of a peculiar order. This ability can be acquired only through long experience in central station work, through the knowledge of a consumer's demand, and through the possession of an aptitude in bringing to the attention of the consumer the possibilities of the use of electricity in such fashion as to create a positive desire to possess these benefits. This does not always mean that the use of electricity can show economies over other forms of energy, but it must take into consideration both the aggregate and the average of the advantages. This ability is high priced, and is possibly beyond the acquisition of a great many companies serving small communities where it is difficult to make the expenditure necessary to produce the desired results.

For the upbuilding of the new business departments of central stations the proposition offered by the Central Station Development of Cleveland, Ohio, is unique. This company has been formed for the purpose of assisting electric lighting companies in building up their commercial departments along the lines and by the modern and improved methods that have stood for success in other fields of endeavor.

The company will be equipped not only to develop and put into effect individual central station campaigns, but to establish as well complete new business departments with record and full working systems developed to a point of efficiency which will enable managers of new business departments to exploit any new apparatus or device that will serve to increase and equalize the load of central stations.

The company is prepared to make expert examination of revenue conditions or take over the commercial departments of lighting plants, either temporarily, until a new system has been established, or to permanently supervise them, the arrangement depending upon the requirements of the management.

The company is preparing a central station handbook containing the data and information covering twelve campaigns, including prices and illustrations, records, application forms, contracts, etc., which will enable the new business manager to put into effect immediately the exploitation of any electrical apparatus which may add to the revenue of his plant.

The officers of the Central Station Development Company, through long association with electrical interests and intimate connection with central stations, are peculiarly qualified to render this service. The president, E. J. Kulas, is known throughout the country as an experienced accountant in electrical matters, and is an authority on modern central station accounting systems. The vice-president and general manager, W. H. Wissing is equally well known for his original ideas in connection with the sale of current for all purposes and for the development of a plan of co-operation between plant manager and local electrical interests.

Selling campaigns based upon the methods adopted by the Central Station Development Company have proven conclusively that central station managers and dealers in the representative towns and cities may meet upon com-

W. H. WISSING.
Vice-President and General Manager, Central Station Development Company.

mon ground and without entering into competition with each other, and so increase their individual fields as to intelligently co-operate for development and healthy growth.

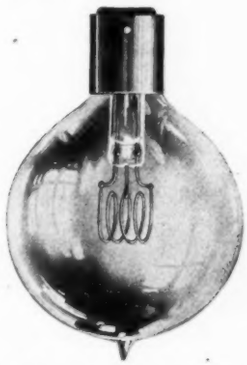
No Discrimination Against Electric Lines.

It is announced that Attorney-General Wickersham, on the advice of President Taft, has withdrawn from the commerce commission court bill the clause denying electric lines through routings and rates with steam lines.

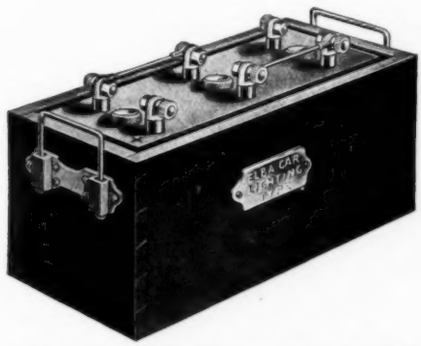
Exports of copper for the week ended February 24 were 2,007 tons. Since February 1 they were 21,266 tons, compared with 12,387 tons the same period last year.

Electric Lighting System for Automobiles.

The interest manifested in automobile lighting systems at recent automobile shows furnishes evidence that the owners of cars and prospective purchasers of cars are in favor of electric lights. The user's point of view may be summarized in two questions, viz., will electricity give the quantity of light and can it be depended upon?



ELBA AUTOMOBILE LAMP.



STORAGE BATTERIES FOR ELBA SYSTEM.

Two systems may be mentioned that are giving satisfactory service. The first which may be called straight storage, has for its foundation a special lighting battery of large capacity and high discharge rate. These batteries can be charged at any garage having charging facilities and will operate two high candlepower head-lights and regulation side and tail-lights for approximately three to five weks; depending on the size of battery and number of hours continuous burning.

The electric generator system which is the straight storage system in addition to a battery charging generator operated while the car is in motion, removes this difficulty and provides a constant source of current which is stored in the battery, and which in turn acts as a distributor and insures a uniform voltage at the lamps.

This system makes possible the use of one central source of electrical energy and one receptacle where this energy is stored, and from which energy is distributed for everything electrical about the car in regular service in addition to providing a reserve for use when the generator is not running.

When the car is in regular service, current is constantly put into the battery and as the batteries used with the Elba system are of high capacity, there is no danger of their being overcharged, should lamps not be used.

To prevent the battery discharging itself through the armature windings when the car is not in motion, an automatic cutout is provided which disconnects the battery from the generator when the car speed is reduced to about six miles per hour. The generator, battry, tungsten lamps and automatic cutout form a complete Pullman car lighting system in miniature. When the car is standing, the lamps are operated direct from the battery.

Special attention has been given to the design of special fittings for remodeling gas and oil lamps for electricity. The severe conditions of automobile service demands great stability and to this point special attention has been given in the construction, of every detail of the system.

The record of tungsten lamps during the past two years has thoroughly demonstrated that they will stand vibration and their life is long enough to make electricity more economical than gas. The possible variation in candlepower range, in the six-volt system, is from two to thirty candlepower.

The generator used in connection with battery removes all objection of unreliability and makes possible the use of many other electrical appliances such as signal horns, cigar lighter, reading lamps, fans in limousines, etc.

The generator maintains a constant current, regardless of engine speed; its output being suited to the discharge rate of the battery so that if the lights are not used, there is no danger of the battery being injured by continuous charging.

The Elba Lighting System for automobiles is being manufactured by the Willard Storage Battery Company, Cleveland, O.

ELBA GENERATOR.

ELBA METER.

Bell Ringing Transformer.

The new bell ringing transformer recently placed on the market by the Westinghouse Electric and Manufacturing Company, will be most agreeably received by those who have had to use electric bells in connection with the old style batteries.

BELL RINGING TRANSFORMER.

As these transformers are made for the purpose of applying the regular lighting circuit to the electric door bell, no attention whatever is required to keep the bell circuit in constant work-

ing order. The application of the device relieves another care and does so at a very small expense; it will displace five or six ordinary house batteries, and will last a lifetime, moreover the operating cost is almost nothing. The original cost of this bell-ringing device compares favorably with that of the house battery system.

The Guaranteed Electric Iron.

In the ELECTRICAL REVIEW AND WESTERN ELECTRICIAN for February 19, 1910, on page 405, there appeared an article descriptive of the six-pound guaranteed electric flatiron, which is manufactured

GUARANTEED ELECTRIC IRON.

by the Guaranty Electric Heater Company, Cleveland, Ohio.

This company is also manufacturing a three-pound iron, shown in the accompanying illustration, which embodies the same commendable features as the one previously described. The heating element is very easily removed by loosening the screw in the center of the top of the iron. The contacts and contact plugs are made large and strong thereby insuring durability. An asbestos plug is used instead of the regular porcelain plug and the whole iron is made to stand a maximum amount of wear and tear.

This iron, as is the case with all irons sold by this company, is guaranteed for one year, a guarantee and warranty bond being furnished with each iron.

New Cars for Chicago Railways.

The Pullman Company will relieve the Chicago Railways Company car shortage next spring with 350 new cars. the last of a 1,000 car order. The Chicago Railways Company will rebuild twenty-five miles of road in the coming season finishing rehabilitation plans. In the first twenty days of February the company gained $48,000.

New Shock Absorber for Tungsten Lamps.

Although the tungsten lamp possesses many advantages over previous types of incandescent illuminants an acknowledged disadvantage of the tungsten as compared with the carbon-filament lamp is its greater fragility. However, it has

DETAIL OF TUNGSTELET.

been demonstrated that by employing proper shock absorbers this disadvantage may practically be eliminated.

In this connection attention is called to the device illustrated herewith, known as the "Tungstelet" and being placed on the market by the Tungstelet Com-

APPLICATION OF TUNGSTELET.

pany, 101 Walker Street, New York, N. Y.

This shock absorber is so arranged that the weight of the lamp socket and shade is balanced against the compression of a spring which may be seen in an accompanying cut. Any vibration which reaches the plunger to which the spring is attached is absorbed by this spring.

A flange on the lower end of the plunger insures against danger should the spring break. As may be seen, provision is made for surplus wire which removes any possibility of strain on the wire and allows the device to preform its function.

Each Tungstelet is tested on a vibrating machine which vibrates the stem above the Tungstelet 1,800 times a minute and in no case has the lamp been affected, although these tests subject the device to more severe conditions than exist in practice.

Three styles are being placed on the market adaptable for use with fixtures, with cluster stems and for low ceilings and show windows, the latter style being a self-contained complete fixture, neat in appearance.

Drop-Out Span Protector.

A new device which is attracting considerable attention this season on account of its reliability and low cost of installation, is the drop-out span

Showing ground ball joint

DROP-OUT SPAN PROTECTOR.

crossing protector of the Central Electric Company. Various methods have been used for the protection of telephone or other low voltage circuits, where crossed by high-tension lines, from the dangerously high potentials which would be impressed upon them in case the latter should break.

To meet the conditions actually found in commercial practice the high-tension drop-out span protector illustrated herewith has been devised.

The device consists of two parts, a fixed element secured to either the top or side of a standard insulator, and a movable element connected to the transmission line and so arranged that by means of a ground ball joint it makes positive contact with the fixed element.

It will be seen that with a span wire, heavy contact is maintained between the two elements of the conductor, but upon the breaking of a span wire the movable element immediately drops out and effectually disconnects, removing any danger which would be caused by a live wire dropping down across the telephone or other wires which might be underneath it.

Electric Fans for 1910.

Notwithstanding the already very complete lines of fans which were offered in 1909 by the various manufacturing companies, there are some marked improvements in several of the fan designs for 1910. Although few of the manufacturers have made any radical innovations in their well tried and proven standard designs it is to be noted that most of the makers have increased the number of their patterns, thereby making it possible to offer fans for every conceivable application. On the other hand, an effort has been made in several cases to reduce the number of stock lines by producing designs which by a simple mechanical adjustment will enable a fan to be used for more than one particular purpose. Noteworthy among these is the improved line of convertible desk and bracket fans which most of the makers are putting out. This kind of fan is not new in principle, but the mechanical improvements tending to increased ruggedness of construction, electrical and mechanical efficiency, and neatness and elegance of design, make it worthy of mention. Often features of the 1910 offerings are the improved lines of oscillating fans, and the efforts that have been made in the applicability of the various fans for use on different circuits. This is especially noticeable in the design of some of the convertible, direct and alternating-current fans which can be used on direct-current circuits or on alternating-current circuits of differing periodicities. Among the offerings for 1910 are the following:

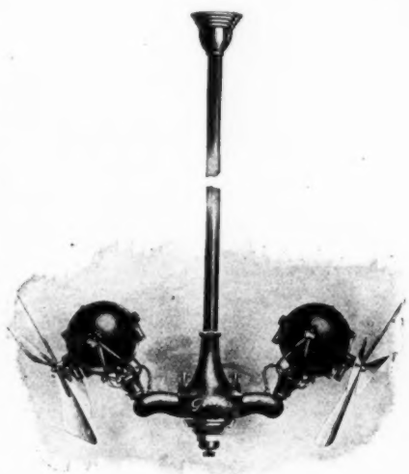
JANDUS ELECTRIC COMPANY.

The Jandus Electric Company, Cleveland, Ohio, has incorporated in its fan models for 1910 a number of refinements along the lines of mechanical and electrical excellence, strength and durability, and neat appearance.

In addition to the usual types of electric fans, the Jandus Company is marketing a special type of eight-inch oscillator which is constructed along the lines of the popular twelve-inch and sixteen-inch patterns.

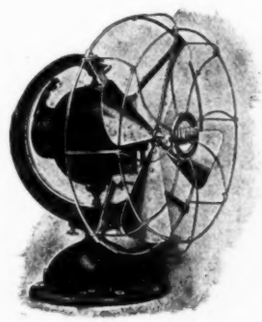
The direct-current fans made by the Jandus company include the following: twelve and sixteen-inch desk and bracket fans, swivel and trunnion type; twelve and sixteen-inch desk and bracket fans, oscillating type; eight-inch desk, bracket, and telephone-booth fans; eight-inch desk and bracket fans, oscillating type.

The alternating-current fans comprise: twelve and sixteen-inch desk and bracket fans, swivel and trunnion type; twelve and sixteen-inch desk and bracket fans, oscillating type; eight-inch desk, bracket, and telephone-booth fans; eight-inch desk and bracket fans, oscillating type.



JANDUS DIRECT-CURRENT GYROFAN (WITHOUT LIGHTS).

The direct-current gyrofans include: twelve and fifteen-inch ceiling fans; twelve and fifteen-inch column fans.



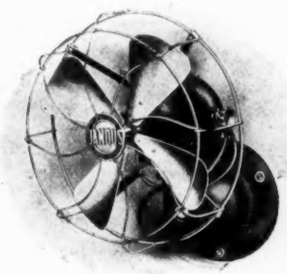
JANDUS ALTERNATING-CURRENT DESK-AND-BRACKET FAN—OSCILLATING TYPE.

The alternating-current gyrofans are made in twelve and fifteen-inch sizes, of both the ceiling and column types. These fans are furnished with induction motors.

Direct-curernt paddle fans are furnished in plain and ornamental types, and alternating-current paddle fans in plain and ornamental induction-motor types.

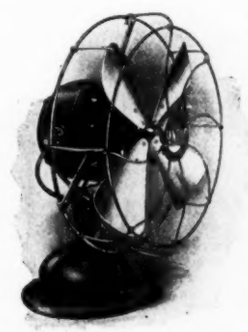
THE WESCO SUPPLY COMPANY.

The Wesco Supply Company, St. Louis, Mo., with warehouses at Fort Worth, Tex., and Birmingham, Ala., is marketing an eight-inch fan which will operate on either direct or sixty-cycle alternating current of 100 to 115 volts. This fan is of very sturdy construction, the base and body being made of heavy cast iron and the guards and blades of heavy lacquered brass. It has a trunnion movement of such design that the motor can be adjusted to any position either as a desk or bracket fan. The change from desk to bracket type is accomplished by simply loosening the wing screw and adjusting body to proper angle.



JANDUS DIRECT-CURRENT BRACKET FAN MOTOR.

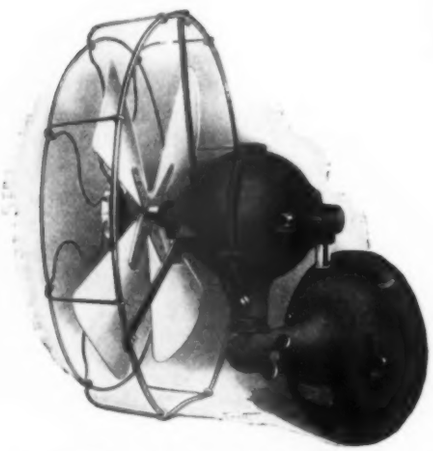
The Wesco Supply Company, following its usual conservatism, has only offered this fan to the trade after exhaustive tests on both direct and alternating current, under the severest conditions of trial.



JANDUS ALTERNATING-CURRENT INDUCTION-MOTOR DESK FAN.

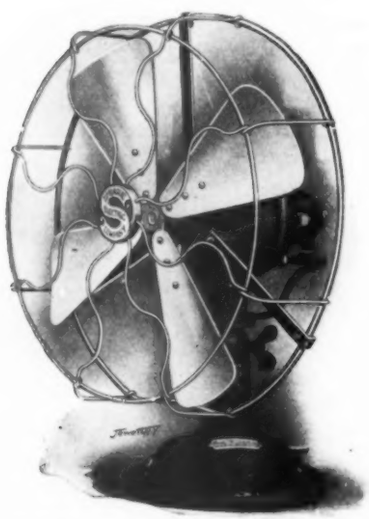
The company is also offering this season a Wesco alternating-current oscil-

lating fan. The oscillating device is of the positive-acting geared type. The fan closely follows the general design of Wesco alternating fans and is equipped with a modified form of convertible base which not only permits the desk fan to be changed into a bracket type, but gives the much desired trun-



LUNDELL SIXTEEN-INCH BRACKET FAN.

nion effect by allowing the motor to be tipped up or down without interfering with its oscillation. This is a very valuable feature as it will permit the fan to be used as a bracket type at a height or seven or eight feet from the floor where the fan can be adjusted to blow over the heads or toward the occupants of the room. The adjustment is abso-



LUNDEL SIXTEEN-INCH OSCILLATING FAN —SPRAGUE ELECTRIC COMPANY.

lutely secure whatever the position of the fan body.

In addition to the two types mentioned above The Wesco Supply Company continues to offer Peerless direct and Wesco alternating fans in standard designs.

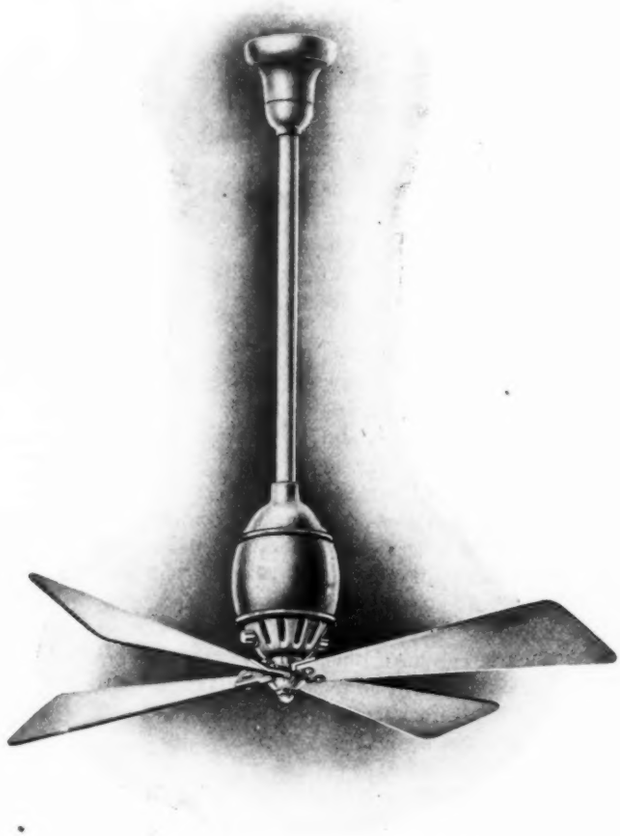
SPRAGUE ELECTRIC COMPANY.

The well-known electric fans manufactured by the Sprague Electric Company, New York, N. Y., maintain their excellence of design and construction for 1910. Slight modifications have been made wherever possible to improve the durability and efficiency of these fans. The guard on the desk and bracket fans has been strengthened by an outer ring. In the center of the guard a name plate has been added which not only increases the attractiveness of the guard, but is also a mark of quality.

In addition to the twelve and sixteen-inch desk and bracket fans, both oscillating and nonoscillating, there has been added an eight-inch hinge-joint desk and bracket fan.

A new type of ceiling fan has been added to the regular standard line of ceiling and column fans manufactured by the Sprague Electric Company. This fan is known as a "midget" ceiling fan and is proportionally smaller than the standard size. It has been developed expressly to meet the demand for a fan that can be used in locations where larger ceiling fans or desk and bracket fans would be unsuitable.

Referring to the illustrations shown herewith, the sixteen-inch direct-current bracket fan, equipped with Lundell universal-joint, is normally finished in black japan, with guards and trimmings finished in dipped and lacquered brass, but nickel plate and other special finishes can be supplied if desired. The universal joint for the motor permits of adjustment either horizontally or vertically and adaptation for either desk or bracket use. Three running speeds are provided by means of a four-point regulating switch. The motor bearings are self-alining and self-oiling. The guard on the sixteen-inch fan is slightly curved upward at the bottom to permit of a maximum downward deflected. This feature is not provided, nor is it considered necessary, in the twelve-inch fan of this design.

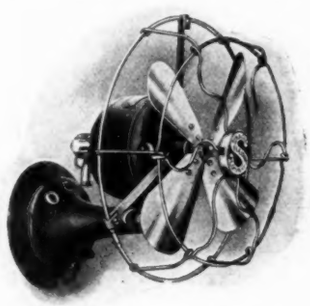


SPRAGUE "MIDGET" CEILING FAN.

The sixteen-inch desk oscillating fan shown in one of the accompanying il-

lustrations is again offered this year to the trade, the motor of which embodies all of the advantages of the Lundell fan in respect to the single-field coil. The improved worm-gear mechanism is of large and generous proportions and is entirely inclosed within a dustproof enameled iron casing. No fine gears are used, thus making for the greatest possible durability. A twelve-inch fan of this design is also made by the Sprague Company.

The eight-inch desk and bracket fan (shown herewith as a bracket-fan) is designed to meet a special demand for residence, hospital, and office use. Light weight, reliability, and neat and artistic appearance are special characteristics of this fan. The motor body is attached to the base by a hinge which permits the fan to be used on either a desk or the wall to which it can be fastened by screws. A friction clamp with a wing nut allows a vertical adjustment of the fan in either position. Three running speeds are provided for by a four-point regulating switch.



SPRAGUE EIGHT-INCH BRACKET FAN MOTOR.

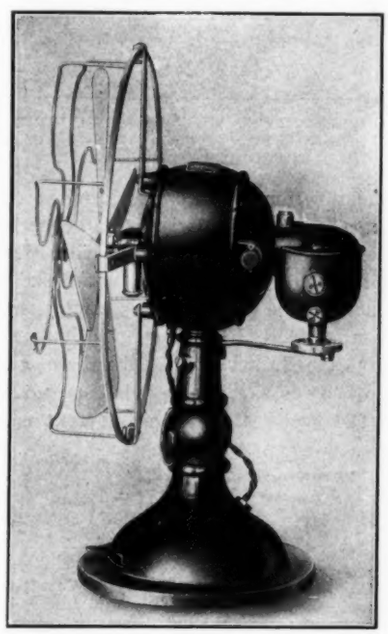
The new model "midget" direct-current ceiling fan is proportionally smaller than the standard-size fan and has practically all the refinements of design of the larger fan with the special advantage of its capability of being used in more restricted quarters. These fans are furnished for one speed only, and no switch control is provided.

Other designs of Sprague electric fans are similar to those of the previous year.

DIEHL MANUFACTURING COMPANY.

The oscillator fans made by the Diehl Manufacturing Company, Elizabethport, N. J., are provided with the universal feature which admits of their use as desk or bracket fans as desired. The divided ball joints have corrugated steel washers on their faces allowing an adjustment to any desired angle by means of the wing screw, as shown in the illustration.

The oscillatory movement is obtained by the use of a dustproof and oilproof detachable case which contains a series of worms and bevel gears. The armature shaft carries a worm of comparatively large size which with the wheel that it drives is carefully designed with special teeth to reduce wear to a minimum. This worm is the only one at all subject to wear and it can be replaced without difficulty if necessary, being readily removable from the armature



DIEHL OSCILLATING FAN SHOWING CASING FOR WORM GEARS.

shaft. The arrangement of the gearing is such that all other parts run at very slow speed and hence will last indefinitely as the wear is negligible.

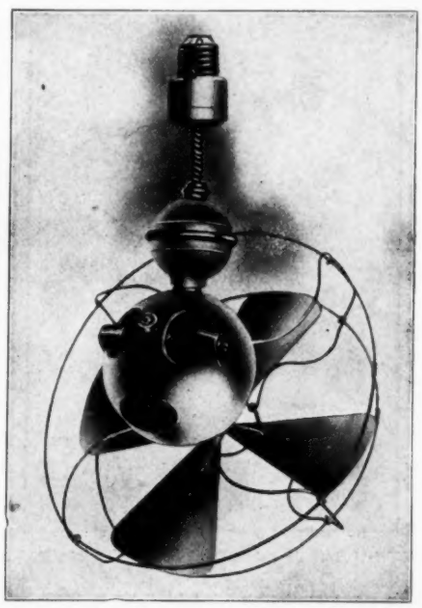
All of the gearing runs in grease at all times and is absolutely noiseless in operation.

Means are provided by which the oscillatory movement may be varied by a simple adjustment easily made. The range is obtained by means of tapped holes in the disk at the bottom of the gear case, the maximum angle being 105 degrees. A hole is also provided at the center to allow of using the fan without oscillatory motion.

The finish is black japan, with brass trimmings and exposed steel parts of oscillator mechanism highly polished. Speed regulators are provided giving three running speeds.

FORT WAYNE ELECTRIC WORKS.

The Fort Wayne Electric Works, Fort Wayne, Ind., is making a full line of fan motors this season, including desk, telephone-booth, revolving and oscillating types; also a full line of ceiling, column and exhaust fans. The desk-type fans this year will be of the induction type instead of the commutator type. This means a fan suitable for desk use and also arranged with adjustment for bracket use. In the induction type of fan motors the object of the design is to do away with all defects and trouble inherent in the commutating alternating-current fan motor. By this means there is produced



FORT WAYNE SUSPENDED REVOLVING FAN.

a fan which, it is claimed, cannot be exceeded in simplicity, and one that cannot get out of order; one that does not give trouble from sparking or other causes.

The telephone-booth type of fan motor will be the same as made last year. This is also an induction type.

The 1910 model of revolving fan is unique in itself, and is the same type as made heretofore by this company.

The oscillating fan lends itself to a very wide range of adustment and is used for both desk and bracket type. The ceiling and exhaust fans are of the usual standard types.

The suspended revolving fan illustrated above finds many popular applications, as for suspension in railroad dining cars, from desk lamp stands, over billiard tables, etc.

PEERLESS ELECTRIC COMPANY.

The Peerless Electric Company, Warren, Ohio, has made improvements in its line of standard fans for 1910. The new models of Peerless fans are fully in keeping with the previous high standard of the company, and superiority of electrical and mechanical design and handsomeness of finish are manifest in every detail.

In addition to the very complete line of fans previously manufactured, are an eight-inch universal desk and bracket fan, and a positive-drive oscillator which is readily convertible from desk to bracket type. This eight-inch fan is

PEERLESS TYPE "ODD" OSCILLATING FAN.

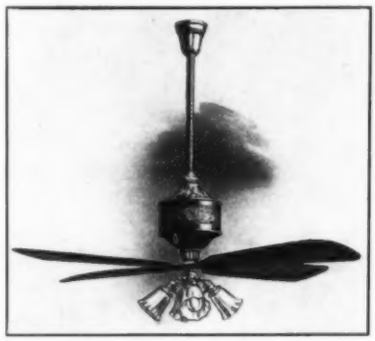
a very handsome model, light in weight, noiseless in operation, and particularly adapted for residence use. It is also suitable for telephone booths.

The Peerless universal desk and bracket fan which was received with favor last year, is retained as the leading type for this year. The blades and guards of this fan are of brass.

The Peerless ceiling fans have been somewhat improved this year, the mechanical details having received some attention from the designers, the switch simplified and the bearings improved. Other features which have proved their reliability by test of continued experience have been retained.

Referring to the accompanying illustrations the type "EE" universal fan, which weighs less than five pounds, meets every requirement for desk use, telephone booths, hotel rooms, and private houses. For telephone booths, ornamental spring suspension is provided to absorb vibration. This fan can be changed over from desk to bracket position without the need of tools, a feature which is extremely advantageous in simplifying dealers' stocks.

The type "ODD" oscillating fan has the new style of positive-drive oscil-



PEERLESS TYPE "HH" DIRECT-CURRENT CEILING FAN WITH FOUR-LIGHT ELECTROLIER ATTACHMENT.

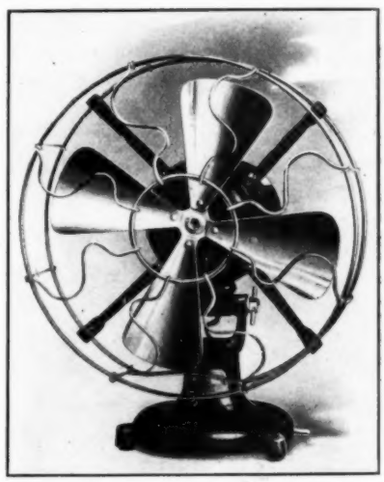
lator mentioned above, providing an extreme range of oscillation of 110 degrees. The travel may be reduced at will. This fan is fully adjustable as desk or bracket type without tools, and works equally well in either position. A three-speed switch is furnished, and the body is carried on ball bearings.

The type "HH" direct-current ceil-

PEERLESS TYPE "JJ" COLUMN FAN.

ing fan, in the standard design, has four blades, fifty-six-inch sweep. A three-speed switch gives speeds of 220, 170, and 110 revolutions per minute. One design is made with a single-speed switch. No switch is furnished in 170-volt or 500-volt fans. The 250-volt fans can be operated in series on 500-volt circuits, and when used with the higher voltage the switch is omitted. The length of the fan from the ceiling to the lowest extremity is four and one-half feet.

The type "JJ" column fan is similar in most respects to the ceiling fan described above, and can be furnished with or without the four-light electrolier shown in the illustration. The height of the floor column is seven and one-half feet to the fan blades. The counter column fans are provided with three feet less column. Three speeds (220, 170, and 110 revolutions a minute) are obtainable from this fan, the rheostat



PEERLESS TYPE "EE" UNIVERSAL FAN.

being located in the fan itself and controlled by a switch mounted on the column just below the blades.

The Peerless Company makes many other types of fans, but the above are shown as being probably the most popular and typical of the various designs.

WESTERN ELECTRIC COMPANY.

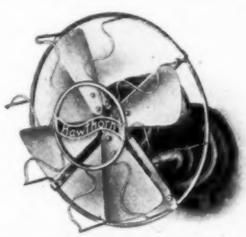
To meet the requirements of ventilation by means of portable fans the Western Electric Company, of Chicago and New York, has, besides the fan motors which have been offered in previous years, several new types as shown in the accompanying illustrations. The present line of fan motors for the season of 1910 includes fans for all conditions of service and for operation on all commercial circuits. In order to meet the growing demand for small and oscillating fan motors, the line in these fans has been considerably increased.

The new Hawthorn oscillating alternating-current and direct-current fans are of the desk and bracket design, and both wind and mechanically operated. The mechanically operated oscillating fan is a thoroughly new type, and is arranged so as to be readily used as

HAWTHORN DIRECT-CURRENT TELEPHONE-BOOTH FAN.

either desk or bracket purposes, without an adapter.

A new type of telephone booth fan has been designed which is handsomely finished and furnished with three operating speeds. The fan is especially designed to operate noiselessly, and, as



HAWTHORN ALTERNATING-CURRENT DESK-AND-BRACKET FAN USED AS BRACKET FAN.

seen in the illustration, provision is made for the absorption of all vibration. The fans are furnished to operate on both an alternating-current and direct-current circuit.

The desk types of the Hawthorn fans

HAWTHORN COUNTER COLUMN FAN.

in eight-inch, twelve-inch and sixteen-inch designs are adjustable for use either as desk or bracket fans and operate on several voltages. The eight-inch fans are very attractive and especially adapted to small offices and homes. Like the larger sizes, they are operated on three speeds and on various voltages.

The Hawthorn slow-speed desk fan is provided with six blades and operates at from 950 to 1060 revolutions per

HAWTHORN DIRECT-CURRENT OSCILLATING FAN MOTOR.

minute. This fan is of a very popular design and is especially adapted to residences.

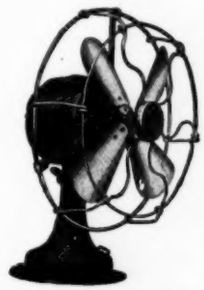
The Hawthorn floor, counter, column and ceiling fans are designed for both direct-current and alternating-current circuits in three speeds. All the new fans along this line are fully up to the standard of similar Hawthorn fan motors of previous years. For thoroughly ventilating kitchens, chemical laboratories, etc., several outfits are furnished for mounting in wall openings.

The Western Electric Company has just issued its 1910 fan motor bulletin, which describes in detail all fans which it has placed on the market, and also gives interesting data in connection with the operation of these fans.

GENERAL ELECTRIC COMPANY.

The 1910 designs of the fan motors of the General Electric Company, Schenectady, N. Y., although substantially the same in external appearances as those of 1909, possess a number of refinements in both the mechanical and electrical design which contribute greatly to their attractiveness, convenience, and reliability. Substantial additions have also been made, including eight-inch desk, bracket, and telephone-booth fans; twelve-inch six-blade residence fans; twelve-inch and sixteen-inch standard desk and bracket fans; twelve-inch and sixteen-inch oscillating desk and bracket fans, and ceiling and column fan motors.

The eight-inch desk, bracket, and telephone-booth fan motors have many superior qualities. Since the frame and base are made from drawn brass, the weight is very much reduced and a smooth exterior surface is obtained to which a lustrous black copper-oxide finished is applied. The normal operating speed is quite low, so that the fan is practically noiseless. A highly effi-



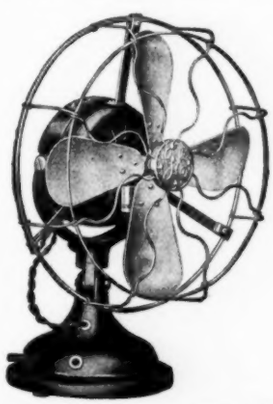
GENERAL ELECTRIC EIGHT-INCH-TYPE FAN MOTOR.

cient air delivery is possible because of the employment of the propeller type of blade. The energy required is less than for an eight candlepower incandescent lamp. This fan will be found particularly well-suited to residence and small office use.

The twelve-inch blade residence fans are designed for use in residences, hospitals and places where the humming sound produced by four-blade fans operated at speeds necessary to produce a sufficient circulation of air is objectionable.

Residence-type fans are furnished in the twelve-inch size only. With the exception of being wound for lower speeds and equipped with six blades, the motors are identical with the standard four-blade type.

The oscillating fan motors possess many marked improvements. The posi-



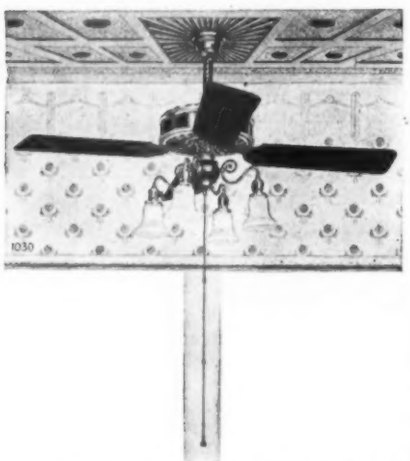
GENERAL ELECTRIC DESK FAN.

tive oscillating mechanism permits the use of all the features and adjustments of the standard fan motors. The motor is reliable in operation at all three speeds, whereas wind-operated oscillating motors can be used at high speeds

only. The oscillating mechanism is designed in such a way that it does not interfere with the adjustments, or the change from desk to bracket type and vice versa. A knob on the spindle enables the oscillating mechanism to be instantly thrown in and out of action while the motor is running.

Oscillating fan motors have, approximately, the same general characteristics as desk motors of similar rating. The additional power required to operate the oscillating devise is but three to five watts, or about one-tenth of the power taken by a sixteen-candlepower lamp.

At full speeds the motors will make approximately six complete oscillations per minute. This rate is considered to be most efficient and best suited to the general conditions and is uniform and



EMERSON CEILING FAN WITH ELECTROLIER ARMS FOR TUNGSTEN LAMPS.

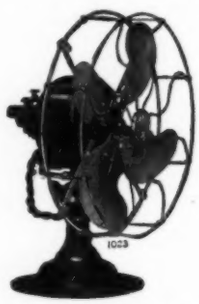
positive throughout the entire range. They can be installed in any position and will oscillate at any speed at which the motor can be operated.

A marked improvement has been made in the method of adapting the General Electric Company's fan motors for either desk or bracket use. The body is hinged to the base by a yoke. A friction clamp is provided by means of which the motor can be quickly adjusted for either desk or bracket use without the use of any additional parts, it being simply necessary to loosen the screw in the base to allow the vertical adjustment of the motor in either position.

The swivel and trunnion adjustment permits a quick change in either a horizontal or vertical direction and also allows the body of the motor to be adjusted to suit the varying heights of desks on which the fans may be placed. The motor body is held in any desired position by a thumbscrew on the yoke. The motor is pivoted on its horizontal center line of gravity and hence does not become overbalanced when clamped in other than its normal position.

EMERSON ELECTRIC MANUFACTURING COMPANY.

The Emerson Electric Manufacturing Company, St. Louis and New York, of-



EMERSON OSCILLATING FAN.

fers a complete line of desk, bracket, oscillating, ceiling and column fans for alternating current. These are induction fans in all sizes and types.

The eight-inch induction fan offered by the company last season is again a feature of the line, this being a substantial swivel-trunnion motor with convertible bracket base, permitting use as a swivel-trunnion bracket fan without extra parts. The twelve and sixteen-inch, four-blade, medium-speed Emerson fans are improved types with new style guards and other minor im-

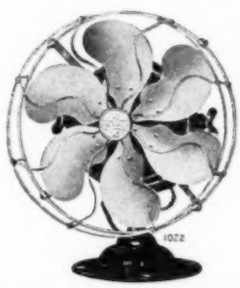
EMERSON EIGHT-FAN DESK FAN.

provements. The distinctive features of the Emerson desk fans are the stationary shaft of hardened steel with bearing which is practically oiltight and dustproof, and the Parker blades with curved cutting edges.

A new type slow-speed very quiet desk fan is offered again this season for residence service. This residence type twelve-inch fan with six blades is also made in the oscillating style for the season of 1910, especially for residence dining rooms, for which use, it is claimed, ordinary oscillating fans are not sufficiently quiet.

Two new types of four-blade, medium-speed oscillating fans, twelve and sixteen-inch, are also offered by the Emerson Company this season. These are positive-acting, geared-type oscillators, with adjustable range of oscillation and an adjustable base, permitting the blades to be tilted or depressed, giving the much desired trunnion effect. These oscillating desk fans may be used as oscillating bracket fans without extra parts, and when so installed the blades may be tilted or depressed the same as with a tunnion fan.

The most radical improvement in Emerson oscillators for 1910 is the new worm shaft, entirely separate from the rotor shaft The worm wheel and gears are of a new and exceedingly substantial pattern, inclosed in a gear case at the rear of the motor, giving protection from dirt, etc. The worm wheel may readily be renewed in case of accident, and should the worm shaft itself be damaged by interference with the os-



EMERSON TWELVE-INCH RESIDENCE-TYPE FAN.

cillating movement of the fan, the worm shaft as well may be renewed in five minutes with a screw-driver without taking off either fan or guard, or taking the motor-body apart. All wearing parts of the oscillating mechanism of the Emerson 1910 model may be renewed by the user without returning the fan to the factory.

The Emerson Company also offers Trojan desk fans in twelve and sixteen-inch swivel-trunnion styles and twelve and sixteen-inch oscillating styles at slightly lower prices than Emerson desk fans. Trojan fans have revolving steel shafts, improved bronze bearings of a type which may be renewed outside the factory, and have blades of the conventional triangular shape.

The same types of Emerson ornamental and Trojan plain type four-blade ceiling fans as sold during 1909

are offered by the Emerson Company for the season of 1910. A new model Emerson ornamental type three-speed ceiling fan with a sweep of sixty inches is offered for small offices, and especially for residence service. This two-blade fan gives the maximum speed regulation.

A new adaptation of the ornamental type of ceiling fan, either two or four-blade, offered by the Emerson Company is shown herewith. This is a fan hung with blades close to ceiling, where they are above surrounding lamps, even in cases where the new high-power metal-filament lamps are installed, well above the eye level. By hanging ceiling fans in this manner, the blades throw no shadows. An extension switch handle is provided in place of the usual switch handle, where it is desired to hang ceiling fans in this manner.

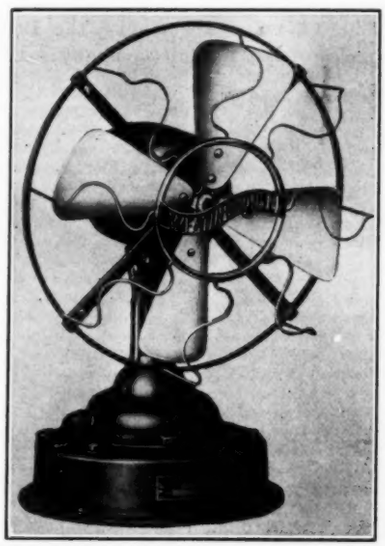
If desired the new high-power lamps themselves may be suspended from the ceiling fan, where fans are hung with blades close to ceiling and the switch operated by the extension handle. In such cases the lamps are well above the eye level, as is desirable, according to best engineering practice. If the fan is hung to a solid ceiling, it is claimed there is no damage to the lamp through vibration caused by the fan.

Emerson plain and ornamental type fans can be furnished with columns or counter columns if desired.

WESTINGHOUSE ELECTRIC AND MANUFACTURING COMPANY.

The direct and alternating-current fan motors listed by the Westinghouse Electric and Manufacturing Company (Pittsburg, Pa.) for 1910 include numerous types and sizes adapted to any class of service. The direct-current motors are designed to operate on nominal 110 and 220-volt circuits; the alternating-current motors on the same voltages and any commercial frequency.

The twelve and sixteen-inch swivel and trunnion desk fan motors may be readily converted into the bracket type by means of a simple adapter, without the use of tools or without disconnecting lead wires. These fan motors can be adjusted through a wide angle in both the horizontal and vertical planes, permitting the breeze to be directed as desired. The variable speeds with which they are provided make them suitable for residences, offices, clubs, etc.; the lowest speed produces a moderate breeze, while at the highest speed the fan motor delivers a very strong breeze suitable for a large room during the hottest weather. The finish of the motor body and base is polished black enamel. The blades are finished in polished and lacquered brass, and the guard in dipped and lacquered brass.



WESTINGHOUSE EIGHT-INCH FAN MOTOR. WITH ALTERNATING-CURRENT DIRECT-CURRENT SUB-BASE.

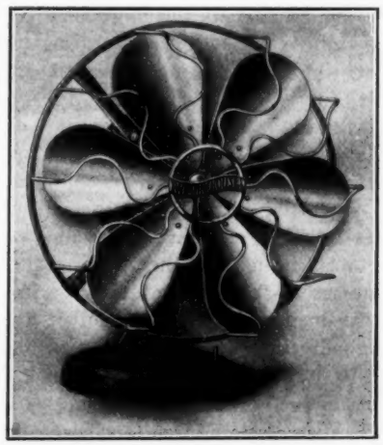
The oscillating motion of the twelve and sixteen-inch air-operated oscillating desk fan motors is produced by the reaction of the air from the fan upon two

WESTINGHOUSE DIRECT-CURRENT CEILING FAN MOTOR.

small vanes which are alternately thrown directly across the path of the breeze on either side of the center of the fan. These fan motors are so designed and constructed that they will oscillate through any angle desired, or will rotate on their axes, thus setting the air of the entire room in circulation.

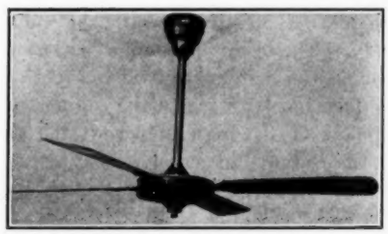
The eight-inch desk and bracket fan motors are designed for use where strong breezes from the larger fan motors would be objectionable. Being hinged mounted, they are quickly changed from the desk to the bracket type. As the external parts of this fan are made of sheet metal, the fan is elegant in appearance and light enough to be moved from place to place without inconvenience.

In hospitals, libraries, sleeping rooms,



WESTINGHOUSE SIX-BLADE SLOW-SPEED RESIDENCE FAN MOTOR, WITH TWO-SPEED SWITCH.

etc., it is imperative that fan motors run without noise. For such places the six-blade, slow-speed residence type is especially preferable, as it delivers a moderate breeze through a considerable range and performs its functions very quietly. Either of two speeds may be obtained by means of a self-contained switch and speed regulator. Residence fan motors are furnished in the swivel and trunnion desk and bracket and air-



WESTINGHOUSE CEILING FAN MOTOR WITHOUT LIGHTS.

operated oscillating desk types, and are of the same high-grade construction as the standard twelve and sixteen-inch motors. These fan motors are supplied in the twelve-inch size only and for sixty-cycle, alternating-current circuits only.

The eight-inch telephone-booth fan motors are exactly similar, in electrical

design, to the eight-inch desk and bracket type, but are spring-suspended; this prevents the transmission of the vibration of the moving parts to the booth. To facilitate the removal of the fan motor from the bracket for cleaning, etc., without disturbing the base or wiring, a connector is provided in the circuit between the motor body and the base.

The converting alternating and direct-current sub-base for the eight-inch fan motors permits the use of the 100-125-volt, sixty-cycle, alternating-current, eight-inch fan motors on 100-125-volt, direct-current circuits, or on 100-125-volt alternating-current circuits of twenty-five to thirty, forty or fifty cycles. This device will prove of particular advantage to those purchasers of alternating-current fan motors, who may in the future require fan motors for different circuits from those upon which the fan motors were originally intended to operate.

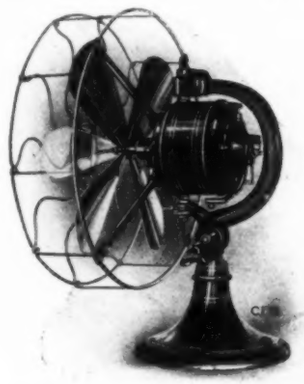
The Westinghouse ceiling fan motors have proved a pronounced success in those places where large fans suspended from the ceiling produce better results than the desk and bracket types. Two standard finishes and speeds are supplied for use on alternating-current circuits, viz.: ornamental mottled copper-finished fan motors have three speeds, and plain black japan-finished fan motors have two speeds.

With the exception of the method of mounting, the ceiling and column fan motors are practically identical. They are provided with four securely fastened blades made of well seasoned and specially treated wood finished in mahogany. A speed regulator and switch are located directly beneath the motor body. The counter column and floor column fan motors are used to great advantage in places where the ceilings are too low or too high to permit the use of the ceiling fan motor. They are especially adapted for stores, restaurants, etc. The columns of the floor column fan motors are of sufficient length to bring the fan blades approximately seven feet above the floor, while those of the counter column motors are of suitable length for mounting on tables or counters. Floor column fan motors with mottled copper finish have columns finished in black japan to the height of tables or counters; the reducing casting and all above it are finished in mottled copper.

ROBBINS & MYERS COMPANY.

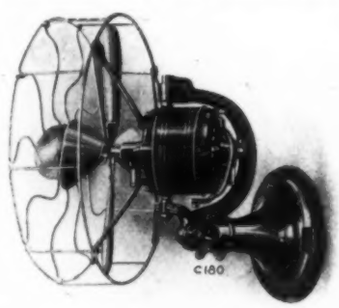
The Robbins & Myers Company, of Springfield, Ohio, which is now marketing fans for the fourteenth consecutive season, has this year made a special effort to produce the completest line of fans possible, so far as to include a fan for every purpose and to meet every purse.

The following are among the 1910 models offered by this company: Di-



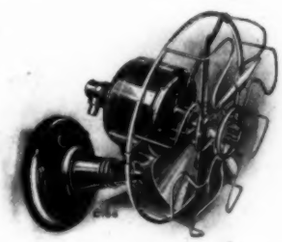
ROBBINS & MYERS MODEL 10 UNIVERSAL OSCILLATING DESK OR BRACKET FAN IN DESK POSITION.

rect-current style "A" electrolier ceiling fan, with four blades eight and one-half inches wide and sixty inches sweep, three-speed switch giving running speeds of 100, 150, and 200 revolutions per minute, and consuming ninety-five watts at full speed; direct-current style "A" ceiling fan, similar to the preceding but without the elec-



ROBBINS & MYERS MODEL 10 UNIVERSAL OSCILLATING DESK OR BRACKET FAN.

trolier attachment, with three-speed or one-speed switch, as desired; direct-current style "C" electrolier ceiling fan, with four blades eight inches wide and of fifty-eight inches sweep, three-speed switch giving speeds of 100, 150, and 200 revolutions, and taking 110 watts at full speed; a fan similar to preceding, without electrolier, and with either three-speed or one-speed switch; direct-current style "B" ceiling fan, with four polished light wood blades seven and one-half inches wide and of fifty-four inches sweep, consuming 110 watts at a speed of 200 revolutions; alternating-current style "D" induction-motor ceiling fan, with two or three speeds, four blades of sixty inches sweep, and consuming 155 watts at full speed—constructed for various current frequencies, and with or without electrolier attachment; model 8 eight-inch desk or bracket fan, with starting and stopping switch and rheostat giving two speeds, 1,000 and 1,700 revolutions, the lower speed for practically noiseless running as in sick rooms—adjustment made by wing nut and trunnion joint—fan is furnished for direct current or alternating current of various frequencies; model 4 desk-and-bracket fans, direct-current high-power swivel-and-trunnion type, twelve-inch and sixteen-inch sizes—smaller fan consumes forty-two watts, and the larger, sixty-six watts at the highest of the three speeds provided; model 10 universal oscillating desk or



ROBBINS & MYERS MODEL 8 EIGHT-INCH DESK OR BRACKET FAN.

bracket fans, direct-current and induction-type alternating-current, twelve-inch and sixteen-inch sizes, self-starting; model 6 oscillating desk fan, similar to the preceding, but not convertible for bracket use; model 6 oscillating desk fan, direct-current and induction-motor (various frequencies) alternating-current types, twelve-inch and sixteen-inch sizes—may be supported or specially designed black enameled cast-iron bracket for use as a bracket fan; model W-8 desk-and-bracket fans, alternating-current swivel-and-trunnion type, induction motor, twelve-inch and sixteen-inch sizes, with two-speed regulator in base; small exhaust fans, direct and alternating-current types, twelve-inch and sixteen-inch sizes; self-cooled "Ilg" exhaust fans, direct or alternating current, with or without "Ilg" automatic shutters, etc.

Current Electrical News

GREAT BRITAIN.

(Special Correspondence.)

LONDON, FEBRUARY 19, 1910.—The Court of Appeal gave judgment a few days ago concerning the validity of the Bremer flame-arc-lamp patent. There is an interesting history attaching to this litigation. Some time ago the British Westinghouse Company, which owns this patent, came to the conclusion, on very eminent legal advice, that more than one English arc-lamp maker was infringing its patent, and in order to test the value of the patent, proceedings were brought against G. Braulik, who was marketing an Eclipse lamp and which, I believe, was mainly imported from the Continent. Before this action could come on, however, Mr. Braulik took proceedings under the new patent act and alleged that the Bremer patent should be declared void for the reason that it was not worked to an adequate extent in this country, according to Section 27. In the first place the Comptroller of Patents declared the patent void on the ground alleged, but on appeal to the courts this decision was set aside and the patent restored to life. The action for infringement against Mr. Braulik then came on with the result that in the court of first instance, i. e., the Chancery Division, the judge decided that there was no subject matter in the patent and that it was invalid. This decision again was appealed against, and the Court of Appeal has now held that the patent is valid and a perfectly good one, and that the judge in the court below took too wide an interpretation of the claim. The Appeal judges expressed the opinion that Bremer's patent marked a distinct advance in arc-lamp manufacture with its floating feed, and that neither the Graham nor the Crosby patents, which were relied on as anticipations, gave any hint that a floating feed was intended. An important point of law was laid down. It was argued in the case that to take known principles and apply them together, was not invention. The Appeal judges said that this was unfair to inventors and was not countenanced by English law.

The Illuminating Engineering Society has been giving much attention recently to the question of glaring illuminants, and the formation of an international committee to collect evidence on the subject will shortly be put in hand. The indiscriminate use of large sources of light in the shape of flame-arc lamps, quite close to the pavements—for instance outside tobacconists and tailor shops—has become quite common in London recently, and there has been introduced a serious element of danger to pedestrians in crossing roads, as these lamps are never shaded on the traffic side. The Commissioner of Police in the city of London has just issued an order for such lamps to be shaded on the traffic side, but as this regulation only applies to one square mile of London, it will be seen there is a large field for educating the people in the proper uses of light. It is also a common practice to use metal-filament lamps in rooms without any shades, which is distinctly unpleasant for the eyes. The Institute of Electrical Engineers has been giving the matter much thought in relation to their new building and I believe a form of indirect lighting has been adopted. Two evenings have been devoted to discussing the subject by the Illuminating Engineering Society and a great deal of good may be expected, for the question is being taken up both by engineers and physiologists.

A novel innovation is to be made by the Bristol Tramways Company. It is nothing less than the exploitation of aeroplanes. Two of the directors of the Tramways company propose to start the manufacture of aeroplanes in Bristol and to arrange for demonstrations which they anticipate will attract visitors from all over the country and incidentally bring much grist to the tramway mill.

The scheme for amalgamating the Yerkes tube railways in London into one company has been sanctioned by the shareholders. The bill, of course, has still to receive the sanction of Parliament, but there is little serious opposition to it from outsiders, except, as there is to all schemes, by the London County Council. When the proposal is put into working order there will be a considerable saving in expenditure in addition to the advantages to be obtained from centralization of control. G.

CONTINENTAL EUROPE.

(Special Correspondence.)

PARIS, February 18.—The new electric railroad known as the Ofenberg Bahn will run partly on Swiss territory and partly in Austria, and the total length according to the present plans is thirty-five miles. It starts at Zernez on the Swiss side and runs thence over the Ofen pass to the Austrian frontier at the town of Münster, ending at the station of Schluderns, which lies on the Vintschgau railroad in the Tyrol. The starting point on the Swiss side is a station on the Rhatische railroad, so that the electric line gives a connection between the two railroads. About eighty per cent of the total length lies on Swiss territory. The road reaches many points in the mountain having a high altitude, and the maximum point is 1973 meters. The highest gradients are about forty per cent. In order to supply the current, a hydraulic plant of some size will be shortly erected on the Etsch River at the locality of Mals, and it will be laid out to produce single-phase 6000-volt current.

The new aerial cableway which runs up the slope of the Wetterhorn has been meeting with considerable success since the start. We already had occasion to illustrate this line, which has many novel features. According to the most recent figures as to the traffic there were carried 6270 persons during the period between June 5 and September 30, 1909, and this is about double the number for the preceding season.

The Paris-Orleans railroad has lately ordered 900 train lighting outfits on the Brown-Boveri system, and these are to be built at the company's branch factories in the suburbs of Paris. Each set includes a variable voltage generator working from forty-eight to sixty-four volts and delivering 2,120 watts. By the use of the new automatic regulator on the machine, the lamp voltage does not vary by more than two and one-half volts at train speeds varying between fifteen and eighty miles an hour.

Among the recent projects in Italy, I note the electric lighting supply of the towns of Cisterna and Resana, also the project to be carried out by the Volta Company for furnishing current to San Fedele in the Como region. The towns of Mole Canavese, San Grato, and Rudiano are also to have a supply of current in the near future.

In Austro-Hungary there is to be built an electric railroad from Pressburg to the frontier. The installing of the line will probably be carried out by Ganz and Company. A. DE C.

EASTERN CANADA.

(Special Correspondence.)

OTTAWA, ONT., MARCH 5.—The officials of the Mines Power Company, of Cobalt, Ont., state that their 10,000 horsepower hydro-electric plant on the Matabitchouan River will be ready to deliver power throughout the silver camp in a short time.

In the Ontario legislature, the provincial treasurer has announced that the entire $3,500,000 loan floated by the province for the construction of the Hydroelectric power project of the government, had been taken up with the exception of $20,000, which the government had decided to retain. Practically all this loan was subscribed and taken up in Canada.

At the annual meeting of the Demerara Electric Company, held in Montreal, this week, the financial statement for the year, ending December 31, 1909, showed a surplus of $29,742, after payment of bond interests and sinking fund charges.

The interesting announcement was made at the meeting of the Porto Rico Railways Company, held this week at Montreal, that a dividend on the common stock of the company would likely be paid this year. The company had had the best year in its history, the net earnings being $194,343, an increase of $21,744, or twelve and one-half per cent. Both the railway and lighting departments showed marked progress.

Such has been the increase in the amount of business that the Canadian Pacific Telegraph Company has to deal with between Montreal, Winnipeg and the Pacific coast, that four additional lines are to be built. The company has at present six wires to Winnipeg and one through to Vancouver, B. C. These, with the four new wires running to Winnipeg, will bring the number up to ten.

The Electrical Development Company will at once proceed to increase its power capacity at Niagara Falls by 35,000 horsepower, which will give the company a total of 85,000 horsepower. The extensions and additions rendered necessary by this new move will cost something like $500,000. The extensions will be financed by the Toronto Power Company, which controls the Electrical Development concern.

The Grand Trunk Pacific railway has asked the Dominion government for authority to erect wireless stations across the mountains to connect Edmonston with Prince Rupert at once. This would not only be a great commercial advantage, but would aid materially in construction work, and at the same time make it possible for the general manager at Winnipeg to communicate with the officials in charge on the Pacific Coast. The surveyors engaged in running the Calgary line of the Grand Trunk Pacific are now as far south as Olda.

There promises to be a long and bitter fight between the Montreal Light, Heat and Power Company, and the new Canadian Light and Power Company, which is to bring electric power to Montreal from the Beauharnois Canal. The new company has been busy all winter in getting its power house and plant at Beauharnois

ready, and such progress has been made with the buildings, generators, transformers and transmission lines, that it will be able to deliver 20,000 horsepower in Montreal by the end of the coming summer. The officials of the company say that no difficulty was experienced in raising the millions of dollars of capital the company required in order to make an effective start against its formidable competitor. W.

IMPORTANT DEVELOPMENTS.

7,000 KILOWATT PLANT FOR SANTA ANA CANYON.—The new power plant of the Southern California Edison Company, to be erected in Santa Ana Canyon, will probably be begun early in the spring. The plant will have a 7,000-kilowatt capacity and will cost about $600,000. General Superintendent B. F. Pearson, Redlands, will have charge of the work.

POWER FROM THE AUGLAIZE.—Plans are being made to dam the Auglaize River about two miles south of Defiance, Ohio, to secure power for industrial plants for that city. It is estimated that 2,500 horsepower can be developed. As the aggregate amount of power now used by the Defiance manufacturing plants is only about 1,500-horsepower, there would be 1,000 horsepower left for other plants which might locate there.

WEBER CANYON PLANT NEAR COMPLETION.—The plant of the Utah Light and Railway Company in Weber Canyon is soon to be turned over to the company for operation. When completed the plant will generate 5,000 horsepower. The pipe line which brings the water to the plant is a departure in generating electricity by waterpower in the west. Instead of following the old plan of having the pipe line follow the sides of the mountain for several miles, and then dropping suddenly to the power plant, as is done by practically every power company in the west, this line starts from a point a little over three miles up the canyon and follows, as nearly as possible, the natural drop of the river, with the exception that, instead of following the many turns of the Weber, the big pipe line takes a comparatively straight course. It goes through parts of the mountain where the river goes around; it crosses the river at a point where the water of the river drops nearly twenty feet in as many feet, and goes straight on to the power plant. The flume, built partly of concrete and partly of wood staves, reinforced with steel bars, is nearly seven feet across at the opening and gradually narrows to about five feet. It means a clear, straight shoot of water such as has never before been secured by any power company in the west, and it is predicted that this plant will mark a new era in the building of power plants in the west.

TO DEVELOP MINNESOTA POWER.—The development and improvement of water-powers of the Minnesota River and its tributaries are contemplated by the Minnesota River Improvement and Power Company, a company which has been organized by men living in the towns of the Minnesota River valley. The company is capitalized at $1,000,000 and its stock divided into shares of $100 each. It is incorporated under the public-service corporation act and its object is stated in its articles of incorporation as the improvement for "navigation and other public purposes, under the supervision of the government and the state," of the Minnesota River and its tributaries in the state, and of the Lake Traverse and Big Stone, the development and improvement of water-powers for public use, the control of any work of internal improvement upon such streams, or in their vicinity, and the reclamation for cultivation low, marshy or overflowed lands adjacent to the streams. The incorporators are William H. Gold, Redwood Falls; Michael Ferch, Odessa; Frank W. Murphy, Wheaton; A. B. Kaercher, Ortonville; Hans H. Sorlein, Granite Falls; Joseph Smith, Morton; Frank Irwin, Belle Plain; August L. Poehler, Henderson; John H. Diers, Blakely; Albert Fritsche, New Ulm; C. A. Johnson, St. Peter; Thomas J. McElligott, Appleton; J. R. S. Cosgrove, Le Sueur; George Atchison, Mankato; William F. Nelson and L. W. Collins, Minneapolis; James A. Gold, Big Stone City, S. D. The plans of the company contemplate three dams across the Minnesota river, at Ortonville, Lac qui Parle and Redwood Falls. The incorporators say they will be able to control the flood waters of the river and save some 150,000 acres of land from inundation.

Construction Notes.

LIGHTING AND POWER.

FAIRFAX, MINN.— Bonds for $5,000 for the installation of an electric light system have been voted. C.

DAVID CITY, NEB.—Bonds for $20,000 have been voted for the installation of a lighting and water plant. C.

HILL CITY, MINN.—It is reported that Armour and Company, of Chicago, will install an electric light plant. C.

CHISHOLM, MINN.—The council has taken bids for six blocks of the new lighting system along Lake Street. C.

NORTHFIELD, MINN.—H. M. Byllesby & Company, of Chicago, have purchased the electric light plant in this city. C.

ABERDEEN, S. D.—O. L. McQuay has disposed of his interest in the McQuay Electric Company, to J. W. McQuay. C.

DEVILS LAKE, N. D.—It is proposed to install an improved system of lighting on Kelly Avenue and Fourth Street. C.

PINE RIVER, MINN.—H. A. and T. L. Arvig have applied to the council for a franchise to install an electric light plant. C.

NEW ULM, MINN.—H. F. Blomquist is preparing plans for the installation of ornamental curb lights on Minnesota street.

OWATONNA, MINN.—A vote will be taken on issuing bonds not to exceed $50,000 for the erection of a municipal electric light plant. C.

BIGOURNEY, IOWA.—A vote will be taken March 28 on granting a franchise to J. F. Bray to maintain and operate an electric light plant. C.

MINOT, N. D.—E. W. Lane and E. M. Tompkins have organized the Union Electrical Company and will open offices in the Lexington Hotel March 1. C.

MARENGO, IOWA.—The Marengo Electric Light & Power Company has been incorporated with a capital of $15,000 to install an electric light plant. C.

OTHELLO, WASH.—The Othello Improvement Company will erect, at a cost of $17,000, a powerhouse to furnish electric light and power for the city. A.

HOUSTON, TEX.—It is announced that the Stone and Webster Company will expend $700,000 toward improving and extending the Houston Electric Company.

WYMORE, NEB.—A resident has subscribed $10,000 towards the building of a dam across the Blue River with which to supply the town with power and light. C.

LODI, CAL.—Lodi has bought, for $35,000, the Cary Brothers' Electric Light and Water Plant. The former owners will run the plant until July of this year. A.

ELGIN, ILL.—The Elgin Light and Power Company has been incorporated with a capital stock of $15,000, by Thomas L. Deisch, Louis C. Deisch and Peter A. Deisch.

LIDGERWOOD, N. D.—An ordinance has passed its first reading granting a twenty-year franchise to W. R. Movius for the operation of an electric lighting system. C.

SPOKANE, WASH.—The Spokane Railway and Power Company will spend $1,500,000 on an electric lighting plant to be erected at Le Pray, on the Spokane River. A.

ALHAMBRA, CAL.—The Alhambra councilmen are considering bids for new ornamental lighting posts for Main streets. The lowest bid is $3,757.70, offered by C. V. Wisher. A.

SYRACUSE, N. Y.—The Syracuse Light and Power Company has been granted permission by the public service commission, to install an electric light plant at North Syracuse.

INDIANAPOLIS, IND.—The Indianapolis merchants have formulated a plan for a uniform system of downtown street lighting. The latest ornamental equipment will be used. S.

PORTLAND, ORE.—The Oregon Water Power and Land Company has been incorporated here with a capital stock of $100,000 by Charles Stout, G. A. Johnson and J. R. Hollister.

ALBANY, N. Y.—The bill oppropriating $500,000 for a site and powerhouse to supply electricity to the capitol and educational buildings has recently been passed by the Assembly.

FOREST CITY, MINN.—The Power Engineering Company, of Minneapolis, Minn., is figuring on supplying a number of nearby towns with electrical energy from the water power here. C.

COALINGA, CAL.—Under an agreement with the Coalinga Lighting Company, the city of Coalinga is to be furnished with forty tungsten lights, at the rate of $4 a light per month. A.

PLAINVIEW, NEB.—At a special election held here the proposition to bond the city in the sum of $8,900 for the erection of an electric lighting plant carried by a majority of twenty-six votes.

OKAUCHER, WIS.—Henry Schoellkopf, of Milwaukee, proposes to rebuild the dam at a point 2,000 feet below the present site and install an electric lighting plant to be operated by the water power. C.

RICHMOND, IND.—The City Council has ordered the municipal lighting plant to furnish light and power free to the city improvement department free. This is done to encourage municipal improvement. S.

INDEPENDENCE, IOWA.—The contract for the repairs and improvements at the city light and water plant was let to the Westinghouse Electric and Manufacturing Company, of Pittsburg, Penn., for $4,733.

SAN FRANCISCO, CAL.—The Tuolumne Power and Irrigation Company, with a capital stock of $50,000, has been incorporated

by D. A. Jones, G. W. Barnett, C. W. Terry, T. F. McGovern and C. H. Segerstrom.

DAVENPORT, IOWA.—The Tri-City Electrical Supply Co. has been incorporated with a capital of $50,000 to handle electrical supplies. W. T. Ball, president; W. J. Bell, secretary, and I. N. Butterworth, treasurer. C.

DULUTH, MINN.—The Minnesota Steel Company will shortly commence the construction of a power house, in which will be installed two 400-horsepower boilers, a 500 kilowatt generator and a cross compound engine. C.

BEACH, N. D.—The council granted a franchise to Geo. Chrysler, of Wadena, Minn., for the installation of an electric light system. A building, fifty by seventy feet will be erected and a 125-horsepower plant installed. C.

JOURDANTOWN, TEXAS.—E. M. Tom, of Jourdantown, is at the head of a company that has been organized here with a capital stock of $30,000 to install an electric light and power plant. F. P. Wallace is general manager. D.

STOUGHTON, WIS.—The Mandt Wagon Company has installed four of the thirty electric motors to be installed at its shops. The new powerhouse has been completed and two boilers of 125 horsepower each are in operation. M.

MINNEAPOLIS, MINN.—The Minneapolis General Electric Company has commenced suit in the district court to test the validity of the Walker ordinance passed in 1907, governing rates to be charged for electric service. C.

MADISON, WIS.—The United Heat, Light and Power Company of Delavan, has filed articles of incorporation here. The capital stock is $12,000. The incorporators are G. M. Cantwell, G. O. Van Sussmulch and E. E. Dates. M.

BESSEMER CITY, N. C.—The Osage Manufacturing Company, of this city, has decided to partially equip its plant with the electric drive, using about 200 horsepower of electricity to begin with. This mill is equipped with 14,000 spindles.

HOLSTON, TENN.—A charter has been issued to the Holston Electric Company, of Washington county. The company, which has a capital of $20,000, was incorporated by L. S. Jones, G. W. Keys, G. C. Sells, T. A. Cox and E. J. Vaught.

HENNING, TENN.—Plans have been perfected for the construction of our electric light plant combined with an ice plant. The operating company, which is to be known as the Henning Electric Light and Ice Company, is capitalized at $10,000.

COLUMBUS, IND.—The service given by the Central Indiana Lighting Company is by no means satisfactory. The city attorney has been instructed to examine the company's franchise with a view of forcing the company to provide better service. S.

CONCRETE, WASH.—The Guggenheim interests will shortly commence the construction of a concrete dam, 160 feet high. A re-enforced concrete flume will be built to the power house, 4,500 feet away, and turbines installed to develop 25,000 horsepower. C.

TALMOUTH, PA.—Following an address of Eugene Carepnter, treasurer of the Buzzard's Bay Electric Company, before the town meeting, the councilmen voted unanimously in favor of a municipal electric light plant. A sum of $5,000 was voted to carry out this project.

HUNTSVILLE, ALA.—The Huntsville Railway, Light and Power Company is installing machinery in its power plant here that will triple its capacity. General Manager Pulley says that he is preparing for the emergency of future growth of the light and electric railway systems.

COLUMBIA, S. C.—In the annual report of the city treasurer for the year 1909 recently given out, it is shown that the total expenditure for street lighting for the twelve months ending December 31, 1909, was $16,309.95. The city of Columbia has approximately 30,000 population. L.

DELAVAN, WIS.—A modern heat, light and power plant is to be erected here by the Bradley company for its factory. The power house will be a one-story brick building, forty by seventy-five feet in dimensions. A 100-horsepower engine and a seventy-five kilowatt generator will be installed. M.

SEATTLE, WASH.—Robert E. Strathorn and associates have bought the water rights and surveys of the Columbia Development Company, of this city, for $100,000. It is announced that the new owners will construct in the near future a hydroelectric power plant with an ultimate capacity of 60,000 horsepower.

FAYETTEVILLE, N. C.—The formal transfer of the holdings and properties of the Fayetteville Gas and Electric Light Company to the purchaser, Thomas Badger, Jr., has been made, at the figure of $11,000. The sale has been confirmed by the federal court and the new owner proposes to make extensive improvements. L.

WATERTOWN, ILL.—The stringing of the lead cables to be used to convey the power for electric lights and other power in Watertown will be finished by the United Light and Power Company, and early in the spring the village will be equipped with street arc lamps. Nearly every new home erected in the village has been wired.

TUCSON, ARIZ.—The Great Western Power Company has submitted plans to the city council for the development of 25,000 horsepower of electric energy in Sabino Canyon, eighteen miles from Tucson, and the transmission of the bulk of this to this city. The company plans to spend $1,500,000 on the plant and its accessories. A.

MANKATO, MINN.—The Consumers' Power Company, of Stillwater, Minn., has purchased the plant of the Mankato Gas and Electric Light Company. The company will develop a waterpower in the Blue Earth River, eight miles south of this city, the contract for which has been let to a Boston construction company and will involve the expenditure of $250,000. C.

TACOMA, WASH.—In line with the announcements which other firms have made regarding extension work is that the Pacific Coast Power Company will this summer, or as soon as the weather moderates, extend its power lines from the county farm at Sumner to Alderton. In Puyallup the company has recently installed eight new transformers throughout the business and residence sections.

FREMONT, O.—Deeds for twenty-one pieces of property lying along the Sandusky River above Fremont, making transfers to the Fremont Power and Light Company, have been filed. The total consideration amounts to about $100,000. The purchase of this real estate was made in connection with the immense power plant which the company is erecting and equipping in Ballville, near this city. H.

SAN FRANCISCO, CAL.—Articles of incorporation were filed yesterday by the Land and Irrigation Company of northern California. The authorized capital is $2,000,000, of which $500 has been paid up. The object of the new organization is to develop irrigation projects and also to run light and power plants. The directors are Oscar T. Weber, W. P. Read, Burke Corbet and John R. Selby.

ST. MARY'S, O.—In order that five manufacturing concerns in this city may henceforth operate by means of electric power, the city council at a special session, passed an ordinance permitting the Standard Power and Equipment Company to erect poles and suspend wires from the Western Ohio powerhouse. The motors must be ten horsepower or over, the municipal powerhouse taking care of those of lesser size. H.

NEW BRITAIN, CONN.—The Stiles and Reynolds Company, manufacturers of brick, has decided to install electric power in its plant at Berlin. The Housatonic Company, as the light and power department of the Connecticut Company will hereafter be known, has applied to the New Britain board of public works for authority to string poles and wires for the purpose of conveying the electric current to the Stiles & Reynolds plant.

ROCK HILL, S. C.—By almost unanimous vote the town has authorized an issue of $285,000 municipal bonds, the proceeds to be used for waterworks, a municipal lighting plant, and sewerage, a board of commissioners of public works being elected at the same time, with three members, W. C. Whitner, civil engineer; J. J. Keller, architect, and Dr. J. B. Johnson. A liberal part of the issue has been designated for expenditure on the city lighting plant. L.

POTTSTOWN, PA.—The Pottstown Light, Heat and Power Company, with a capital stock of $70,000 and a bonded indebtedness of $40,000, has passed into the hands of outside parties, through a deal consummated with majority stockholders by E. E. Mandeville, of Philadelphia, and John J. Riordan, Jr., of Baltimore. For many years the company has been paying a five per cent yearly dividend. It has the borough street lighting contract and does a large commercial business.

ALBEMARLE, N. C.—After several months of uncertainty as to what plan it should adopt to secure electricity for street lighting, this town has closed a contract with the Southern Power Company, Charlotte, N. C., for current for the purpose named, the city taking sufficient current to light the town and to supply citizens who desire private installations. The town will own its lights and all apparatus appertaining thereto and the contracts have been let for wiring the town, and installing the lighting system. L.

ALBANY, GA.—The Albany Power and Manufacturing Company has elected Louis Joerissen, of Atlanta, president and general manager, to succeed S. D. Pickett, of this city, and it is announced following this action, that an auxiliary steam plant, to cost $50,000 will be erected, and that this will be constructed immediately. The capacity of the plant will thus be increased to 100,000 horsepower, the new addition being ordered to forestall inconveniences that might be occasioned by low water on the river. L.

MAUCH CHUNK, PA.—The annual meeting of the stockholders of the Mauch Chunk Heat, Power and Electric Light Company was held recently and the following officers were elected: J. S. Wentz, president; Lafayette Lentz, vice-president; Ira G. Ross, secretary and treasurer; O. O. Jarrard, superintendent, and the following directors: J. S. Wentz, Lafayette Lentz, William O. Lentz, F. Bertolette, D. B. Wentz, Jonas Sondheim, C. A. Rex, David Ross, H. B. Price, M. S. Kemmerer, Leonard Yaeger, Ira G. Ross and O. O. Jarrard.

AMESBURY, MASS.—The machinery of mills No. 4, 5 and 7 of the Hamilton Woolen Company are now driven by electricity. The power is furnished by the new electric station, which has been constructed as a part of the improvements, and there is a possi-

bility of there being some surplus power which can be utilized in the other mills of the corporation. The operation of these three miles by electricity will eventually mean the discontinuance of the No. 4 boiler-house for a part of year, its only use being to furnish heat during winter months.

DEFIANCE, O.—It now seems probable that the voters of Defiance will be given an opportunity to pass upon the question of a municipal joint light and water plant before the end of the present year. It is estimated that a suitable plant will cost in the neighborhood of $250,000. The city council is unable to reach an agreement with the Defiance Gas and Electric Company, and also with the Defiance Water Company, and it is probable that this will be offered as a solution of the difficulty. An expert engineer will be designated to submit estimates. H.

DALTON, GA.—Councilmen Bearden, Rudolph, Thomas, Mann and Wills, have been appointed a committee to act with Mayor Trammell, to investigate the cost of proposed extensions and additions to the water, gas and municipal lighting plants of the town, and to report back at a subsequent meeting. An election will then be called to vote on bonds for the improvements contemplated, it being understood that something more than $100,000 will be required, and it is assured that the money will be forthcoming and that the work will be begun within the current year. L.

JACKSON, GA.—A third hydroelectric development for Butts County is probable in addition to the Towalgia River Falls Power Company, and the Central Georgia Power Company, which is completing a $3,000,000 plant on the Ocmulgee river to develop 22,000-horsepower. The third development is the proposed plant at Smith's Mills, on the Ocmulgee, projected in connection with the building of the Middle Georgia Interurban Railway by Capt. W. F. Smith and his associates. The new development is at the site of an old development, and it is said that the new work could be accomplished at reasonable outlay. Butts county now has a greater water power development than any other Georgia county. L.

ATHENS, GA.—The James White Power Company has completed arrangements for the development of its waterpower site and will soon begin the work of construction. The Ambursen Hydraulic Construction Company of Boston are contractors for the reinforced concrete construction work. The contract for the entire hydroelectric equipment has been awarded to Allis-Chambers Company and in part will be as follows: Four 1,200 horsepower twin open-flume turbines operating under a head of fifty feet, each directly connected to a 700 kilowatt 12,000-volt, three-phase alternator; one 180-horsepower single open-flume turbine operating under the same head and directly connected to a 100-kilowatt 120-volt exciter.

MIDDLETOWN, CONN.—Samuel E. Elmore, of Hartford, as trustee for the bondholders, has brought suit in the Middlesex County Superior Court against the Salmon River Power Company of East Haddam, the East Haddam Electric Light Company and the American Trust Company, of Boston, to recover on a first mortgage issued to cover a bond issue of $50,000. The action grows out of the default of the principal and interest on bonds issued by the Salmon River Power Company in 1892. The East Haddam Electric Light Company and the American Trust Company are made defendants because they claim to have an interest in the property after that of the plaintiff. The plaintiff asks for a foreclosure of the bonds and the possession of the extensive property which the Salmon River Power Company controls in East Haddam.

ATHENS, GA.—James White, owner of the Star Thread Mills, has formed the James White Power Company and will expend $250,000 or more for the construction of a hydroelectric plant at Barnett Shoals. About 4,000 horsepower will be developed and transmitted by electricity for manufacturing and lighting. The chief user of this electricity will be the Star Thread Mills, which will take 500 horsepower for operating its plant, to which Mr. White expects to add largely in textile machinery. At present the plant has about 7,000 ring spindles for manufacturing yarns, and that equipment may be doubled during the summer. Contract for constructing the power dam, 800x43 feet, with 550 foot rollway, has been awarded. It is reported that several cotton mill enterprises may follow the completion of this waterpower development.

SALISBURY, N. C.—Another important step in the unraveling of the financial tangle of the Whitney Power Company, developing the "Narrows" on the Yadkin River, has been taken, in the departure for New York of Special Master A. H. Price. Mr. Price will preside over a meeting, which promises to be near the last chapter in the long-drawn story of litigation over this extensive waterpower. Special Master Price is delegated to ascertain facts in the case of the Bankers' Trust Company of New York, and others, against the Whitney company, and report back to Federal Judge Pritchard. The hearing embraces a complete inventory of expenses for work already done, the accounting of properties subject to lien, the extent of property subject to lien held by T. A. Gillespie Company, etc. A fight for control by alleged rival interests is said to exist. L.

STILLWATER, MINN.—The state board of control, St. Paul, Minn., has let the contract for the installation of the mechanical equipment in the new prison to be erected at Oak Park, to the Hanley-Casey Company, of Chicago, for $543,400. C.

ELECTRIC RAILWAYS.

(Special Correspondence.)

DES MOINES, IOWA.—The Central Interurban Railway Company has been incorporated with a capital of $10,000. C.

HELENA, MONT.—It is reported that actual construction will be commenced in the spring on the Helena and Butte electric line. C.

MINNEAPOLIS, MINN.—The Twin City Rapid Transt Company will expend $1,000,000 in improvements during the coming year. C.

POMONA, CAL.—The Pacific Electric Railway Company will construct a single track along West Second Street, within a few weeks. A.

SEATTLE, WASH.—The Valley Railway and Power Company has asked for a franchise for an electric railway from Kent to Renton. A.

TECUMSEH, NEB.—A company is being formed with a capital of $1,000,000 to construct an interurban line to Lincoln, Neb., via Auburn. C.

GILBERT, MINN.—The Mesaba Traction Company has been granted a franchise to construct an electric line to Eveleth and Virginia. C.

CLINTON, IOWA.—It is reported that Thos. J. Wilcox will commence construction on the interurban to Dubuque. The third rail system will be used. C.

ALAMEDA, CAL.—The Southern Pacific Railway Company has started construction work on the Encinal Avenue trolley line. The new service will be in operation in April. A.

COLUMBUS, IND.—The Central Lighting and Power Company has decided to extend the local traction line to the fair ground and will improve and maintain a park with attractions. S.

BELLINGHAM, WASH.—The Whatcom County Railroad and Light Company has completed plans for the erection of a brick power house on York Street, estimated to cost $174,000. C.

INDIANAPOLIS, IND.—The traction lines have fully recovered from the blow received by the big snow storms. The cost of fighting snow by the traction lines in Indiana is placed at $100,000. S.

MINNEAPOLIS, MINN.—L. N. Loomis, president, states that construction will be pushed in the spring by the Twin City and Lake Superior Railway Company on an electric air line to Duluth, Minn. C.

FORT WAYNE, IND.—Four new and modern cars have been placed in commission on the Fort Wayne & Wabash Valley line. This company has put in service fifty new cars during the past six months. S.

DES MOINES, IOWA.—According to M. H. Miller, vice president and general manager, plans for the beginning of construction work on the new Sioux City and Des Moines interurban have been perfected. C.

JACKSONVILLE, FLA.—Work will be started by the Baybro Investment Company on laying the Third street car line, as soon as the 150 tons of steel rails arrive. Work has been started on laying the ties.

WILMINGTON, DEL.—The Southern Traction and Electric Company has been incorporated by R. Clough, Dover; M. A. Noble, T. C. Corwin, New York City; J. W. Ebbs, Englewood, N. J. The capital is $100,000.

CORPUS CHRISTI, TEXAS.—The new electric street railway system in Corpus Christi was placed in operation February 28. The lines extend to the three railway depots and traverse the business and residence districts. D.

DECATUR, IND.—The officials of the Fort Waye, Springfield & Decatur Traction Company will soon ask for bids for the construction of an extension of the line from Decatur to Portland, a distance of sixteen miles. S.

INDIANAPOLIS, IND.—Morton S. Hawkins, secretary of the Beech Grove Traction Company is asking for a franchise to enter the city. The company is building a line from Beech Grove to this city—a distance of ten miles. S.

MEMPHIS, TENN.—Plans are being drawn for a $10,000 power house to be erected by the Lakeview Traction Company. Lee Massengale, who was recently elected manager of the company, has charge of laying the track.

MINNEAPOLIS, MINN.—The promoter of the Minneapolis Electric shortline states that actual construction will be commenced the coming season and that by next year the line will be completed to Lake Lillian, a distance of about seventy miles. C.

LOS ANGELES, CAL.—The Pacific Electric is extending its line on West Adams street from Second avenue to Eleventh avenue, a distance of about a mile. The steel for this line has been delivered on the ground and work will be rushed at once.

TERRE HAUTE, IND.—Residents of this city and of Illinois are promoting a traction line to run southwest through the Crawford County oil field to Cairo, Ill. J. R. Campbell has been elected president of the company. It is stated that the work will begin June 1.

LA PORTE, IND.—The Air Line Interurban Railway will endeavor to complete its line from this city to Valparaiso by July 1. The company will then proceed with the construction of a western line to Gary. The company has twelve miles of road in operation. S.

PORTLAND, IND.—The Bryant town board has granted to the Fort Wayne and Springfield Traction Company a franchise to enter the town. This completes all the grants necessary and construction work on the extension between Portland and Decatur will begin April 1. S.

HIGH POINT, N. C.—The North Carolina Public Service Corporation has purchased a lot here for its substation, and has also perfected plans for adding one and one-half additional miles of track to the local street railway. The company at present has one mile of tracks in working order. L.

PERU, IND.—H. S. Dickey, general superintendent of the Winona traction line, and F. D. Norvel, general passenger agent of the Indiana Union Traction Company, met here March 2 and perfected plans for installing through train service between South Bend and Indianapolis, by way of this city. S.

POTTSTOWN, PA.—C. T. Leland, of Philadelphia, secretary and treasurer of the Pottstown & Reading Electric Railway, says that work will begin in a few weeks on the extension from Sanatoga to Royersford, via Linfield. This new line will give Royersford and Spring City trolley facilities to Pottstown.

HOLLIDAYSBURG, PA.—Arrangements have been completed for the survey of the line of the Hollidaysburg-Altoona and Bedford trolley, a passenger and freight road, which will pass through a thickly-populated country not now served by a railroad. The promotors say the road will be finished this summer.

DELPHI, IND.—The promoters of the Delphi, Flora & Burlington Traction Company report that the franchises have been secured to build the road and that contracts will be let in the spring in order to insure immediate construction. The company has been voted substantial subsidies. E. W. Bowen is interested. S.

ALBANY, ORE.—The Albany Interurban Railway Company, with a capital stock of $25,000, has been incorporated by P. A. Young, C. E. Sax and J. H. Hawkins. The compahy proposes to build an electric railroad from Albany to Sweet Home, via Brownsville and Holley and from Albany to Sweet Home via Lebanon. A.

GREENVILLE, S. C.—The survey of the proposed route of the Greenville, Spartanburg and Anderson electric railway is half completed under the direction of Major T. B. Lee, of Charlotte, and the entire survey will be finished in a short time. The line will run through the towns of Piedmont, Pelzer and Williamston extending to Belton. L.

AUSTIN, TEXAS.—The Austin Electric Company is preparing to make important extensions of its street railway system in Austin. George E. Macomber, of Augusta, Maine, one of the chief stockholders of the company, recently inspected the property and conferred with the local officials in regard to the proposed extensions. D.

MINNEAPOLIS, MINN.—A trust deed of $4,000,000 has been filed by the Twin City & Lake Superior Railway Company, of Minneapolis, in favor of the American Trust and Savings Bank of Chicago. Work will now be pushed on the line as soon as the weather permits. The first rail laying will be done a few miles north of this city.

PERU, IND.—The Winona Interurban Company has been granted a franchise to enter this city and make physical connection with the Indiana Union Traction Company and the Fort Wayne & Wabash Valley Traction Company. The company reports satisfactory business over the new line just opened between this city and Warsaw. S.

PLYMOUTH, IND.—S. S. Perley and associates who are promoting a traction line from this city to South Bend say that the work will begin in March and that the material is partly purchased and will be delivered soon. The right of way has all been secured except through two farms. Mr. Perley says the money is ready to build the road. S.

ATLANTA, GA.—The Atlanta Northern Railway, operating the trolley line from Atlanta to Marietta, will change from the alternating to the direct current system during the summer, thus giving a superior service. Each car will be equipped with four seventy-five-horsepower motors, and several substations will be erected along the line of the railway. L.

SAN ANGELO, TEXAS.—The San Angelo Street Railway Company is extending its electric line to East San Angelo and is preparing to build a belt line through the city, the city council having granted it a franchise to use the streets for the purpose. A bonus of $14,000 is being raised by the people of Angelo Heights to induce the company to extend its line to that suburb.

SAGINAW, MICH.—The Saginaw Valley Traction Company, notwithstanding a bitter fight against ratification of the ordinance granted it for a loop in the business district by the Common Council has been started will lay the track and take possession of the streets under the Council's action alone, taking its chances on the franchise being approved by the people at the polls.

CHARLESTON, W. VA.—To construct a network of electric railways connecting Fairmont, Mannington, Morgantown, Blacksville, W. Va.; Waynesboro, Pa., and Pittsburg, the Fairmont & Pittsburg Railway Company, of Fairmont, with capital stock of $1,000,000, has been chartered. Among the incorporators are William M. Lews, of Jersey City, N. J.; H. F. Smith and others, of Fairmont.

LAGRANGE, GA.—The city has granted a fifty-year franchise to Messrs. Akin, Preston and others, of Macon, Ga., and C. M. Awtrey, G. E. Dallis and others, of LaGrange, to build and operate a street railway system here. Under the terms of the franchise, the road must be completed within fifteen months. It is reported that preliminary surveys on proposed road will be made at once. B.

McALESTER, OKLA.—The Choctaw Railway and Lighting Company has been granted a franchise by the city council of Haileyville for the use of the streets of that town for its proposed electric railway system. It is stated that the granting of this franchise insures the early building of the company's proposed interurban electric railway between McAlester and Haileyville. D.

IRONWOOD, MICH.—A. E. Appleyard, of Boston, and H. P. Harmon, of Portland, Me., are negotiating for the purchase of the street railway, electric lighting and water companies operating here and at Hurley. If successful, transmission lines will be built and the water power service extended to the plant taken over and an electric railway, connecting Ashland and the Gogebic range may be built. C.

HAGERSTOWN, MD.—At a meeting of the directors of the Chambersburg, Greencastle and Waynesboro Electric Railway Company, it was decided to increase the capital stock from $600,000 to $2,500,000 and the bounded indebtedness from $1,000,000 to $2,500,000. The money raised by selling additional securities will be used to extend the road from Pen-Mar to Blue Ridge Summit and Monterey.

FRANKFORT, IND.—Oliver Gard, J. V. Kent and Judge Kirkpatrick, of this city, have sold their interest in the right-of-way, franchises, etc., of the Kokomo, Frankfort and Terre Haute traction line, to J. C. Reynolds, of Kokomo, and George J. Marrott, of Indianapolis, who will proceed with the construction of the road. The first link will be built between Kokomo and Burlington and thence to Frankfort and Terre Haute. S.

SPRINGFIELD, ILL.—A license for the incorporation of the Springfield Traction Company to construct a trolley road from this city to Pana and from this city to Vandalia has been issued by the secretary of state. The capital is $10,000 and the headquarters Springfield, with the following incorporators and first board of directors: Ernest Helmle, G. B. Gillespie, A. N. Fitzgerald, George Riordan, all of this city, and C. E. Hazlett, of Rochester.

SCOTTSBURG, IND.—Under advice of the engineer, the Scottsburg and Madison Interurban Company has changed the route through Saluda Township so as to include the city of Hanover. This will make an additional cost of $100,000. John E. Greeley and Charles H. Tennis, of Pittsburg, who are at the head of the company, say the work of building the road and bridges will be begun soon and that material is already purchased and shipped. S.

CAIRO, ILL.—The initial steps have been taken for a new electric interurban line from Terre Haute, Ind., to Cairo, Ill., and article of incorporation have been signed and will be filed with the secretary of state, at a meeting of the directors to be held at Springfield, soon. The directors are: Gen. James R. Campbell, of McLeansboro; Judge C. C. Boggs, of Fairfield; Col. Alden Knopf, of Olney; Joseph B. Crowley, of Robinson, and Isaac H. Webb, of McLeansboro.

ANDERSON, IND.—At the annual meeting of the stockholders of the Indiana Union Traction Company, March 2, the following directors were elected: Randal Morgan, J. Levering Jones, M. S. Morgan, George F. McCullough, Hugh J. McGowan, W. K. Schoepf and A. W. Brady. The treasurer's annual report showed that for 1909 the total gross earnings was $2,103,018.59; operating expenses, $1,113,428.66; net earnings, $989,589.93. There was a surplus of $40,834.30, against a deficit of $10,663 the previous year. S.

WASHINGTON, IND.—The City Railway Company has refused to run its cars for nearly a week, because the city, which recently bought the electric light plant, from which the company got its power, raised the price from one and one-fourth cent per kilowatt to three cents per kilowatt. The citizens, backed by Terre Haute capitalists, have taken steps to organize a new company and extend the city lines to Vincennes, and through the coal fields into Terre Haute. Suit will be brought to nullify the old company's city franchise. S.

GREENSBURG, PA.—W. E. Hilderbrand, vice-president of the Johnstown & Greensburg Railway Company, has announced that work will begin early in April, on the first ten miles of the railroad which will connect Greensburg and Latrobe. The charter name of the company was the Greensburg, Latrobe & Eastern Railway Company. The road is to pass through, Luxor, Latrobe, Ligonier, New Florence, Seward and to Johnstown. Other officers of the company, besides Mr. Hilderbrand, are: Warren Utts, president; R. G. Lohr, secretary, and H. H. Smith, treasurer.

BELPRE, OHIO.—The link between Pomeroy and Belpre, O., to be constructed in the line of the proposed Electric railway be-

tween Cincinnati and Pittsburg will likely be commenced within a very short while. The announcement has been made that all the rights of way between Pomeroy, O., and Parkersburg opposite Belpre have been procured as has also the franchise for the bridge from the council of Belpre, O., which bridge is to span the Ohio River. Sometime ago it was announced that preparations were being made to begin the work in the early spring all the way between Cincinnati and the Smoky city.

WAYNESBORO, PA.—At a meeting of the board of directors of the Chambersburg, Greencastle and Waynesboro Street Railway Company it was decided that the power plant should be enlarged to twice its present size by a practical duplication of the present power plant equipment. This was found necessary as the line is to be extended to the top of the mountain, at High Rock, or to Blue Ridge Summit next summer. It is probably that an addition to the motive power equipment for this new mountain line will be a sub-station on the mountain similar to the one now in use at Marion, along the line from Waynesboro to Chambersburg.

INDIANAPOLIS, IND.—At the annual meeting of the stockholders and trustees of the Indianapolis & Cincinnati Traction Company, held February 25, a plan was adopted for a reorganization and the subsequent exchange of bonds for receiver's certificates. The matter of building an extension of the line from Connersville to Hamilton, Ohio, was also taken up and arrangements will be made to extend the line this summer. Charles L. Henry, receiver as well as president of the company, made his annual report which shows an increase of eight per cent over that for 1908. The following directors were elected: W. T. Durbin, W. J. Alford, John F. Wild, J. J. Appel, G. A. Ball and T. F. Rose. S.

SAN ANTONIO, TEX.—Two hundred workmen are rapidly pushing the construction work of the Lakeview trolley extension to a completion. Rails and ties are being laid on Twenty-fourth street, and an army of men is filling in the low portions of the grade at this point with dirt. Four work trains have been hauling white clay and gravel from South Heights pits, a distance of ten miles. The poles and trolley wires have been put in readiness for the operation of cars for the entire distance of the loop, which is two miles in length. According to information given out by the traction company officials recently, the entire extension will be finished and ready for actual traffic within thirty days.

NORWICH, CONN.—The promoters of the electric road which the Norwich, Colchester and Hartford Traction Company has the franchise to construct and operate announce that $270,000 of the total issue of $300,000 preferred capital stock has been subscribed, and that they expect to place the remainder in Hartford. Arrangements are under way for underwriting a bond issue. The estimated cost of construction is $985,000. The surveys and layout have been completed, and as soon as the details of financing are finished, the work of building will be undertaken. The road will run through a series of communities now inadequately provided with transportation facilities. Twenty-six miles of the road, as laid out, will consist of approximately straight track. The maximum grade will be three and one-half per cent.

ATLANTA, GA.—To issue first mortgage bonds in the sum of $1,050,000 and stock to the amount of $200,000 is the chief paragraph of a petition filed here with the State Railroad Commission by the Middle Georgia Interurban Railway Company. This application came from President L. W. Roberts, of this city, and Brown and Brown, legal representatives, of the electric company, and the Railroad Commission will dispose of the matter on March 9. This is said to be the first definite step taken towards the construction of the interurban electric line to connect Griffin, Ga., with Social Circle, via Indian Springs, Monticello and other towns. If the petition is granted, work will be pushed rapidly, it is understood, on actual building, as a large part of the route has already been graded for the laying of tracks.

CHARLOTTE, N. C.—The Isothermal Traction Company, recently chartered, will be a far more important development than was at first announced, the promoters having in view a line that will extend from Castonia, N. C., to Asheville, penetrating into the mountains of the western part of the state, and passing through Rutherfordton and other towns, opening up a new and undeveloped territory, and traversing one of the most picturesque sections of the Appalachian mountains. Capt. K. S. Finch, of Charlotte, is promoting the line, and he has been detailing the proposition to a representative of northern capitalists who are interested, and it is believed that the requisite funds will be on hand so that work can be started within a few months. This line, according to the promoters, will serve as a feeder to the projected electric interurban system from Greenville, S. C., to Greensboro, N. C., the Asheville line to be about 100 miles in length. L.

TELEPHONE AND TELEGRAPH.

TWO HARBORS, MINN.—It is proposed to organize an independent telephone company. C.

PRESCOTT, WIS.—An ordinance has been passed granting a franchise to the Prescott Telephone Company. C.

CASCADE, MONT.—The Bell Telephone Company is considering the installation of a telephone exchange. C.

ASHLAND, NEB.—T. H. Elliott and A. E. Gas are selecting a site for the erection of a telephone exchange building. C.

CLITHERALL, MINN.—Julius Severson has been granted a franchise for the construction of a telephone exchange. C.

DES MOINES, IOWA.—The Iowa Telephone Company has secured a site near Drake park for the erection of an exchange. C.

PIPESTONE, MINN.—The Northwestern Telephone Exchange Company may rebuild its system here at an expenditure of $25,000. C.

FERGUS FALLS, MINN.—The council granted a telephone franchise to Ludwig Jensen, M. O. Lien, S. M. Skrove and Henry Haldorson. C.

KENOSHA, WIS.—At its annual meeting the Kenosha Home Telephone Company voted an appropriation of $10,000 for immediate extensions. C.

POLSON, MONT.—It is expected that the Rocky Mountain Bell Telephone Company will have a line constructed into Polson by the end of March. C.

LEMMON, S. D.—The Perkins County Telephone Company has been incorporated with a capital of $10,000 by Ole B. Gaummon, C. C. Hoisington and others. C.

MERRY HILL, N. C.—The Bertie Telephone Company, of Bertie county, has been chartered here with $10,000 capital by H. J. Wood, S. J. Adams, and others. L.

DEERING, N. D.—Residents of Margret township will consolidate with the Lone Star Telephone Company, A. F. Thomas, manager, to build a line into Deering. C.

PAYNESVILLE, MINN.—A rural telephone company has been organized at Lake Henry and will connect with the local exchange. A rural telephone company may be organized at Spring Hill. C.

ASHLAND, NEB.—It is reported that the Plattsmouth Telephone Company has secured a site for the erection of a brick telephone building. The company will rebuild most of the farm lines. C.

SUPERIOR, WIS.—The Tri-State Telephone Company has acquired control of the plants of the People's Telephone Company here and at Duluth, Minn. It is understood that considerable extensions will be made in Northern Wisconsin. C.

EAU CLAIRE, WIS.—The Citizens' Telephone Company has been organized at Chetek, near Eau Claire, for the purpose of installing a modern telephone system there, connecting the place with Chippewa Falls, Bloomer and Eau Claire. The company has a capital stock of $5,000. M.

STOCKTON SPRINGS, ME.—The Stockton Springs Telephone Company has been organized at Stockton Springs, for the purpose of conducting a public telephone business, with $5,000 capital stock, of which $2,200 is paid in. The officers are: President, Harry P. Hichborn, of Stockton Springs; treasurer, Herbert L. Hopkins, of Stockton Springs.

MENASHA, WIS.—The West Menasha Telephone Company has been organized among the farmers of West Menasha for the purpose of building a line to connect with the Menasha exchange. Officers were elected as follows: John Tofler, president; William Grimes, secretary and treasurer; Henry Smith, Fred Schroeder, Reuben Thompson, directors. M.

MADISON, WIS.—The Wisconsin Telephone Company is to spend $750,000 in Wisconsin in new lines and various improvements. A new trunk line of twenty wires is to be run between Madison and Milwaukee. Ten of these will be through lines and the other ten will connect with intermediate points. Seven circuits are now in operation between Milwaukee and Madison by the Wisconsin Telephone Company. M.

NEW RICHMOND, WIS.—The St. Croix Telephone Company, with a capital stock of $25,000, has been organized here in competition with the Wisconsin Telephone Company. The city council has granted the company a fifty-year franchise. Construction work is to start at once, and it stated the system will be in operation within sixty days. The company has elected the following officers: L. A. Baker, president; John J. Padden, vice-president; H. E. Rounsavell, secretary and treasurer. M.

MAMMOTH SPRINGS, ARK.—The Hynson Brothers' Telephone Company of this place today bought the defunct plant of the South Fork Telephone Company, embracing lines to Hardy, South Fork and Morristown, Ark. Also parallel line to Thayer, Mo., as also all their local lines and phones in Mammoth Spring and elsewhere. The purchase adds seventy-five miles additional country lines to the Hynson Brothers already large system and gives Mammoth Springs an outlet in every direction.

MADISON, WIS.—The state tax commission has made the final assessment of the telegraph companies operating in Winconsin. The valuations and tax levied are as follows: Chicago & Milwaukee Telegraph Company, valuation $16,000; taxes levied, $180.05. Chicago, Milwaukee & Lake Superior Telegraph Company, valuation, $105,000; taxes levied, $1,181.59. North American Telegraph Company, valuation, $165,000; taxes levied, $1,856.78. Western Union Telegraph Company, valuation, $1,625,000; taxes levied, $18,286.51. The total valuation amounts to $1,911,000 and the taxes levied to $21,504.93. M.

CHARLOTTE, N. C.—The purchasing of equipment for operating trains in the south by means of the telephone, is steadily increasing. The Southern Railway has purchased from the Western Electric Company material for putting in telephones and selectors on a sections of its route, and other divisions may soon be equipped in similar manner. The Central of Georgia Railway has arranged to put in this service from Atlanta to Augusta, and from Macon to Camak, Ga., a total distance of about 250 miles, while the Seaboard, and Atlantic Coast Line Railways are also using the new equipment over parts of their lines. L.

AUSTIN, TEXAS.—The Austin City, the Williams County and the Bell County Independent Telephone companies passed out of the hands of receivers a few days ago and their respective holdings were merged into a new company, incorporated under the name of the United Telephone Company of Austin. The property embraces four exchanges, Austin, Taylor, Temple and Belton. It is stated that the new company will expend $75,000 in improving the merged system. It has a capital stock of $300,000. The incorporators are I. B. Cameron and H. N. Daugherty, of Columbus, Ohio; James S. Brailey, of Toledo, Ohio; W. D. Hart and George W. Allen, of Austin. Independent long distance lines connect the four exchanges and give them an outlet to all the larger towns of Texas, there being more than 1,100 miles of independent long distance lines with which they will work in harmony, according to the official announcement. The receiver of the Austin company was W. C. Kingsbury, and of the Williamson and Bell counties' companies, E. A. Glass. The court discharged these two receivers, winding up their work. They kept the properties in good condition during their management and accumulated a surplus of about $10,000 to be divided among the bondholders. The holdings of these counties were sold under foreclosure proceedings last May to the Columbus Savings and Trust Company, of Columbus, Ohio, for $96,000 at the instance of the holders of $300,000 of bonds of the companies. D.

LEGAL NOTES.

DUTIES OF COMPANIES AND EMPLOYES WHERE POLES ARE USED JOINTLY.—When two companies engaged in enterprises calling for the use of wires to carry electricity arrange for the joint use of a pole to sustain them, each company, the Supreme Court of Ohio holds, in Cincinnati Gas and Electric Company vs. Archdeacon, is, with respect to such use, charged with the same duty toward employes of the other as to its own, and the correlative duty of the employes to exercise due care for their own safety is the same as to both companies. There can be no recovery against an employer for an injury to an employe which he would not have sustained if he had not voluntarily and unnecessarily used an appliance for a purpose other than that for which he knew it to be intended.

DUTY OWED STRANGER ENTERING TRANSFORMER ROOM OF OWN VOLITION.—A man wishing to see the superintendent with a view to purchase some old sheet iron or junk which he had previously seen stacked in the yard, and having been told that the superintendent was in the transformer room, entered that room. There was nothing in the situation or surroundings which could have led any one into the belief that it was the room into which the public was invited for purposes of business or otherwise. Every appearance indicated that it was a workroom and nothing else. The supreme court of Pennsylvania holds, Edmundson vs. the Monongahela Light and Power Company, that the company, having done nothing and suffered nothing to indicate to the public that they were free to enter the room, no duty rested on it to anticipate the entry of the man and make provision for his safety. In going into the room he took the risk of the place, and shared the common danger to which all were exposed by reason of the machinery being as it was. If from the fact that the wall was down and the room thereby exposed, an implication of invitation to enter at that place arose, such implication certainly could not extend to others than those whose employment was there. Nor did the fact that when the man told the superintendent that he wanted to speak to him he received the reply, "Wait a minute," constitute an invitation to remain. That was simply notice that the superintendent could not be interrupted at that moment in his work. Except as the superintendent had reason to believe that the party interrupting him was under some disability, ignorance, or helplessness of some kind, which exposed him to peculiar liability to injury in the place he was, no duty could have rested on him to caution the party with respect to the machinery about him. He had a right to assume, until otherwise informed, that the party was one who had a right to be there, or that, being there, he was able to take care of himself. To construe the remark of the superintendent into an invitation to remain would require the court to hold, if the man was in fact simply an intruder, that the company could only escape the duty of looking after his safety by promptly turning him out.

NO ACTION MAINTAINABLE FOR DEATH FROM INABILITY TO CALL PHYSICIAN DUE TO TELEPHONE BEING OUT OF ORDER.—A telephone subscriber whose wife was taken violently sick tried to call the family physician over the telephone, but could not get connection with the central office because the telephone was out of order, due to the negligent condition of the ground wire. He then got on his horse and went after a physician, but when the latter was got to the house the woman was in a dying condition. The court of civil appeals of Texas holds in the case of the Telegraph and Telephone Company vs. Solomon, that the damages in the circumstances were too remote and were not such as both parties would reasonably have understood and contemplated as likely to result from the breach of the contract or the negligence of the company. If there had been a specific contract with the telephone company by which it had agreed to transmit or to furnish facilities for transmitting this particular message to the physician, or if the object and purpose in having the physician summoned over the telephone to immediately attend the woman was previously made known in proper time to the company under the general contract of telephone service, then there might have been some analogy between this case and the various telegraph cases where telegraph companies have been held responsible for such damages for failure to promptly transmit and deliver the message.

It was argued that, where the apparatus is installed in a house, the contract for telephone service is to keep the system in working order, so that when one subscriber wants to transact any business with another subscriber to the system the company will put the party wanted to the telephone and make such connections so that the two can transact the business they desire by talking over or through the telephone, and that the contract does not contemplate that the company is to have notice of the nature of the conversation or business. But, even so, the contract is one of lease of the instrumentalities, and not of indemnity against any and all loss or damage that might result to or befall the renter of the instrumentalities from failure to get proper telephone service. As a necessary deduction from the rule of law that damages are recoverable only if they flow from the breach in the natural course of events or within the contemplation of the parties, it follows that damages so remote as to fall without these rules cannot be recovered.

RIGHT OF INDEPENDENT CORPORATION TO MAINTAIN POWER PLANT IN CITY TO SUPPLY RAILROADS.—The supreme court of New York, appellate division, second department, reverses, in the case of People vs. Transit Development Company, a conviction of the defendant company of maintaining a public nuisanse in maintaining, in the borough of Brooklyn, an electric plant which emitted from its smokestacks small flakes or particles of hard coal that fell upon the passers-by, and were blown or sifted into the houses within a certain radius. The company offered in evidence the certificates of incorporation of the railroad companies comprising the Brooklyn rapid transit system, and offered evidence tending to prove the relations existing between them and it, that the Brooklyn Rapid Transit Company owned all of its capital stock, that it sold power only to them, and at cost, and that it was not practicable for them to get the power elsewhere, all of which evidence was excluded. The court says that when the legislature authorized the organization of corporations to construct and operate electric roads in cities, it of course contemplated the construction of such road as exist in the borough of Brooklyn. In view of the location of that city and of its rapid growth, it must have been within the contemplation of the legislature that power plants would have to be located where possible annoyance or discomfort to private persons might be caused. That did not authorize the taking of private property without making compesation, but it prevented the thing authorized from being a public nuisance. The defendant company, however, was endowed only with the powers which any individual might exercise, and could claim from its certificate of incorporation no greater rights. The railroads could have acquired, under the power of eminent domain, the site for this power plant and the property rights infringed by its maintenance, a cogent reason for thinking that the railroads would have legislative permission to maintain it. But the defendant company had no such power, and there was as much reason for saying that the power of eminent domain to acquire the site could be devolved as that the permission to maintain the plant upon the site when acquired could be. A right, specially granted to a quasi public corporation, cannot be devolved by it upon an individual. But while the defendant company might not have legislative permission to run this power plant in one sense of that term, it did have the right to engage in the lawful business of supplying the street railroads with power, and mere discomfort arising therefrom to individuals, which was only incidental—indeed, it might be said necessary—to the existence of this great city, did not justify a public prosecution. It was not contaminating the air with noisome and noxious vapors and gases, nor could it just as well conduct its business in some remote place. The place selected by it appeared to be as suitable as any that could be selected—at least, a jury would probably think so. It was a question of fact upon the evidence whether the business could be conducted without the emission of cinders from the smokestacks. With the excluded evidence in the case, it might also be a question whether the maintenance of this power plant, or one like it in some similar place, was necessary to the running of the railroads if those questions should be resolved in favor of the defendant, it could not be credited that a jury, properly instructed, would convict the defendant of maintaining a public nuisance merely because particles of hard coal in place of black smoke emitted from its smokestacks.

ELECTRICAL SECURITIES.

Financial markets have been noteworthy for the decided veering of sentiment toward cheerfulness. This betterment went hand in hand with substantial advances in prices on the stock exchange, and there was thus completed the traditional cycle through which Wall street invariably passes on the eve of developments which it considers of far reaching importance. A short time ago there occurred the widest break in securities witnessed in the course of the reaction which set in shortly after the opening of the new year. That break marked the culmination of the decline which had for its moving causes, according to Wall street opinion, anxiety on the part of the larger interests of the financial world over the corporation program of the administration. Offerings of securities running to about $75,000,000 and the heavy March 1 disbursements had little or no effect upon the money market.

Chicago Oak Park Elevated Company's daily average traffic for February was 47,000, an increase of 9.4 per cent.

The Niagara Falls Power Company has given a mortgage to the Bankers' Trust Company, of New York, for $20,000,000 to secure refunding general mortgage gold bonds.

The Electric Bond and Share Company reports for the eleven months ended December 31, 1909, a surplus of $467,897, as compared with $464,133 surplus on January 31, 1909.

Books of the United Railway and Electric Company, of Baltimore, will close March 24, and reopen April 14 for the annual meeting, to be held April 13.

The annual meeting of the Central Union Telephone Company will be held at Chicago Telephone headquarters on March 16.

The annual meeting of the stockholders of the Union Gas and Electric Company was held March 7. Fifteen directors were elected to serve for one year.

February gross earnings of the Boston Suburban Electric Companies increased three per cent compared with 2.06 per cent increase in corresponding month a year ago. In January the gross increased 6.41 per cent.

The Boston & Worcester Street Railway has petitioned the Massachusetts Railroad Commission for approval of an issue of $360,000 twenty-year 4 and one-half per cent additional first mortgage bonds, for extensions, additional rolling stock, etc.

The Chicago Telephone Company has paid $132,698 as a three per cent gross earnings' tax to the city of Chicago for the second half of 1909, or the largest semi-annual compensation, on a statement showing total earnings of $4,423,298.

February gross receipts of Interborough Rapid Transit failed to show the comparative increase of recent months. The gross averaged to increase about $5,100 daily, or $142,000 for a month, a gain of fractionally more than six per cent. This compares with an average monthly gain for the six months ended January 31, 1910, of 11.1 per cent. For the eight months of its current fiscal year, Interborough Rapid Transit has now increased it gross receipts nearly $1,800,000, which is actually greater than the $1,716,093 increase for all of the fiscal year ended June 30 last.

DIVIDENDS.

The Brockton & Plymouth Street Railway Company's regular semiannual dividend of $3 per share on the preferred stock, payable March 15 to stock of record March 4.

Dallas Electric Corporation; regular semiannual dividend of $3 on the first preferred stock, payable April 11 to stock of record March 25.

Interborough Rapid Transit Company; regular quarterly dividend of two and one-fourth per cent, payable April 1 to stock of record March 25.

NEW YORK.

	Mar. 7	Feb. 28
Allis-Chalmers common	11⅞	11⅞
Allis-Chalmers preferred	42	41
Amalgamated Copper	81¾	76
American Tel. & Cable	*80	*80
American Tel. & Tel.	141¾	140⅜
Brooklyn Rapid Transit	75½	74⅝
General Electric	154½	153
Interborough-Metropolitan common	21¾	21
Interborough-Metropolitan preferred	55	55
Kings County Electric	129	130
Mackay Companies (Postal Telegraph and Cables) common	90	89
Mackay Companies (Postal Telegraph and Cables) preferred	76½	76
Manhattan Elevated	137	135
Metropolitan Street Railway	15	16
New York & New Jersey Telephone	123½	123½
U. S. Steel common	85⅝	80⅝
U. S. Steel preferred	121	119¾
Western Union	77	74½
Westinghouse common	73	130
Westinghouse preferred	130	.....

* Last price quoted.

BOSTON.

	Mar. 7	Feb. 28
American Tel. & Tel.	141⅜	140⅜
Edison Elec. Illuminating	247	248
General Electric	154½	153
Massachusetts Electric common	18¼	17½
Massachusetts Electric preferred	83	83
New England Telephone	136	135½
Western Tel. & Tel. common	15	14
Western Tel. & Tel. preferred	88½	89½

PHILADELPHIA.

	Mar. 7	Feb. 28
American Railways	45⅝	46½
Electric Company of America	12	11⅞
Electric Storage Battery common	59½	60
Electric Storage Battery preferred	59½	60
Philadelphia Electric	15¼	15⅝
Philadelphia Rapid Transit	22⅝	24½
Philadelphia Traction	88	88¼
Union Traction	49⅛	50½

CHICAGO.

	Mar. 7	Feb. 28
Chicago Railways, Series 1	106½	106
Chicago Railways, Series 2	32½	33
Chicago Subway	3¼	3½
Chicago Telephone	131½	128½
Commonwealth Edison	115	115½
Metropolitan Elevated common	16	16
Metropolitan Elevated preferred	54	51
National Carbon common	108	106
National Carbon preferred	118	118

PERSONAL MENTION.

W. E. ATHEARN has recently been appointed engineer of equipment for the Western Union Telegraph Company.

FREDERICK W. WHITRIDGE, receiver of the Third Avenue Railroad Company, New York city, has returned from a trip to Bermuda.

A. F. HOCKENBEAMER has been elected second vice-president of the Pacific Gas and Electric Company, in addition to the office he now holds of treasurer and comptroller.

J. T. QUINLAN, manager of the Green Bay district of the Wisconsin Telephone Company, has tendered his resignation to take effect March 15. He will go to the Pacific Coast to assume an office with the Bell Telephone Company.

C. B. BAKER, of Lima, Ohio, who was formerly in the Lima offices of the Western Ohio, has been appointed auditor of the Toledo, Bowling Green & Southern, at Findlay. He will fill the vacancy made by the death of William McClure.

EDWARD HEMMETT, JR., of Philadelphia, Penn., has taken the position of superintendent of the railway department of the Sheboygan Light, Power and Railway Company, at Sheboygan, Wis., succeeding Henry J. Pagel, who has been given exclusive charge of the rolling stock department.

LUDWIG KEMPER, who has been manager of the Albert Lea Light and Power Company, of Albert Lea, Minn., for the past four and a half years, has resigned to go with the Fuel Engineering Company, general consulting and contracting engineers, of Chicago, in which company he has purchased an interest.

CHARLES BLIZARD, third vice-president and general sales manager of the Electric Storage Battery Company of Philadelphia, has just returned East after an extended trip through the West. Mr. Blizard visited the sales offices of the company at Cleveland, Chicago and San Francisco, and also spent some time in Seattle and Los Angeles.

W. T. GENTRY has been re-elected president of the Southern Bell Telephone Company, following the stockholders' meeting in New York, when directors were elected for the new year. Mr. Gentry has been with the company twenty-seven years, and has filled his present position about two years. J. Epps Brown was elected vice-president and general manager again, and J. M. B. Hoxsey, vice-president, and Addison Maupin, acting secretary and treasurer, was re-elected.

J. M. SMITH, better known as "Buckeye" Smith to the lamp buying public, has recently been appointed sales manager of the Moline Incandescent Lamp Company, of Moline, Ill. He is perhaps the father of modern industrial illumination. His work in the textile mills of the east was the beginning of the revolution which has taken place in textile and industrial mill lighting. While a young man he worked in these mills before entering the lamp business. His intimate knowledge of lamps and also of the industries brought him success as a salesman and illumination expert. Mr. Smith was for eight years the eastern representative of the Buckeye Electric Company, and there are few lamp men in the east better known to the trade than he.

A. G. PATTESON, purchasing agent of the Crocker-Wheeler Company, Ampere, N. J., was one of those who assisted us in the preparation of our estimate of the value of electrical and kindred products for the year 1909, these estimates forming the basis of a statistical table which was published in the issue of January 1. While the figures submitted by Mr. Patteson relating to generators and motors only were used, the fact has since been called to our attention that he estimated within one-thirtieth of one per cent of the total approximation as worked out in the completed table. Out of the fifty-five figures given by Mr. Patteson, twenty-five were identical with those published in the table, and he was only $10,000 out of the way on the total amount estimated, which was $304,225,000.

JOHN M. EGAN, of Chicago, has been selected by the board of directors of the Metropolitan Street Railway Company, of Kansas City, Mo., as president, to succeed Bernard Corrigan, who recently retired. Under the new management, a complete revision of the fiscal end of the company will be made. Mr. Egan is an experienced railway man, having been identified with the service since 1863, when he began his career as a machinist's apprentice, and steadily advanced to general manager and ultimately to president of the Central of Georgia. His latest activities have been in connection with the solution of the Union Station and terminal problem in Kansas City, and which he succeeded in working out.

Three years ago he resigned the latter position and went to Brazil to build railroads. He is sixty-two years old and a native of Springfield, Mass.

H. W. HILLMAN, for three years sales manager for the Grand Rapids-Muskegon Power Company, has resigned to take his first vacation in twenty-seven years. Secretary George L. Erwin probably will look after his duties until next month, when it is stated there is to be a general reorganization of the administrative forces of the company. This probably is due to planning for the conduct of the local properties which are a part of the big Commonwealth Power, Light and Railway Company in which the Grand Rapids-Muskegon Power Company is a factor. Mr. Hillman had been away from Grand Rapids and contemplates returning to the East where he made his home for many years. He has been prominently identified with the electrical work and organizations of the country for years and has made many friends in Grand Rapids. He is a member of the American Institute of Electrical Engineers, the National Electric Light Association and until recently president of the Michigan Electrical Association. He is widely known for his researches into electrical work. For years he was connected with the General Electric Company at Schenectady, N. Y. The electric arc lighting system of Grand Rapids is one of the local results of his work and he was mainly responsible for the recent electrical show, the first ever held outside the big cities of the country.

OBITUARY.

THOMAS JOHNSON CUSHING, an engineer in the employ of the Western Electric Company, died on February 28 at his home in New York city, aged thirty-seven. He was the son of Louis P. Cushing, and was graduated from Harvard in 1894. He was a member of the Harvard and the Telephone Clubs of New York. He leaves a widow, Ethel Pittman Cushing. He was for fourteen years an engineer with the New York & New Jersey Telephone Company.

CHARLES H. SCHERMERHORN, a wartime telegrapher, died in Plainfield, N. J., on March 1. He was born at Hatboro, Penn., in 1833, and at the age of seventeen became an operator at the "magnetic telegraph" experimental station at New Hope, Penn. From there he was sent to New York, where he opened the original office in the old Irving House in Broadway. Afterward he became the operator at the Barnum Museum, and later to Brooklyn, where he sent the first message to New York.

LAZARUS F. MINZESHEIMER, for nineteen years general attorney for the Chicago City Railway Company, died on March 2, following an operation. Mr. Minzesheimer was born in New York on July 5, 1861. He was a graduate of the Unoin College of Law in Chicago. In 1874 he became an attache of the state's attorney's office during the term of J. S. Grinnell. Later he was connected with the city attorney's office, from which he was appointed attorney for the City Railway. The funeral was held at his residence, 3544 Grand Boulevard. He is survived by his wife.

PROPOSALS.

TELEPHONE LINE.—I. M. Ingebretson, secretary of the Ox Creek Farmers' Telephone Company, of Rolette, N. D., will receive bids up to March 15, for the construction of fifty miles of two-wire telephone line complete. A check for $100 must accompany the bid. C.

POST OFFICE, COLUMBUS, NEB.—The office of the Supervising Architect, Washington, D. C., will receive sealed bids until April 14, for the construction complete (including plumbing, gas piping, heating apparatus, electric conduits and wiring), of the United States post office at Columbus, Neb., in accordance with the drawings and specifications, copies of which may be obtained from the custodian of site at Columbus, Neb., or at the Supervision Architect's office.

POST OFFICE, ASHTABULA, OHIO.—The office of the supervising architect will receive sealed bids until April 11, for the construction complete (including plumbing, gas fitting, heating apparatus, electric conduits and wiring), of the United States Post Office at Ashtabula, Ohio, in accordance with drawings and specification, copies of which may be obtained from the custodian of site at Ashtabula, Ohio, or at this office at the discretion of the Supervising Architect.

NAVY DEPARTMENT SUPPLIES.—The Bureau of Supplies and Accounts, Navy Department, Washington, D. C., will open bids on naval supplies on the dates given below. Bidders interested therein should make early application for copies of the schedule, giving the schedule numbers desired. Schedules can be obtained from the Navy Pay Office nearest each navy yard. Bids will be asked on the following supplies:

Date of opening.	Material.	Quantity.	Delivery at	Schedule No.
March 15—Conduit steel, enameled		5,000 feet	navy yard	
	Fuses	2,010	Norfolk, Va.	2295
	Tubes, conduit terminal and water-tight box	Miscellaneous	Portsmouth, N. H.	2294
March 22—Cable, telephone, lead covered		2,300 feet	Brooklyn, N. Y.	2302
April 5—Conduit and couplings		Miscellaneous	Norfolk, Va.	2312
	Fans, ventilating	4	Puget Sd., Wash.	2306
	Wire, copper	850 pounds	Puget Sd., Wash.	2309
			Mare Island, Cal.	2308

NEW PUBLICATIONS.

MINERAL PRODUCTION OF CANADA.—The report of John McLeish, of the Division of Mineral Resources and Statistics of Canada, has been published in pamphlet form. This booklet gives very complete tables of mineral production for the years 1908 and 1909.

THE CORNELL UNIVERSITY REGISTER (the annual catalogue) for 1909-1910, which has just been received, contains several new features and information of considerable interest to the educational world, as well as complete outlines of all courses given by Cornell University and items of great importance in other lines bearing upon the university's growth and development.

UNIVERSITY OF ILLINOIS BULLETIN.—The engineering experiment station of the University of Illinois has published bulletin No. 35, on the study of base bearing plates for columns and beams. The work of investigation and preparation of the paper was done by N. Clifford Ricker. Formulas giving the safe load for steel and cast-iron plates of the usual forms are set forth and a series of tables makes the designing of such plates a very simple matter.

THE UNIVERSAL ELECTRICAL DIRECTORY, 1910.—Under this title Alabaster, Gatehouse & Company, London, Eng., publish annually an electrical directory which embodies many valuable features. The 1910 edition contains 33,095 names. Telegraphic addresses, telephone numbers and codes are given in the alphabetical sections, and also financial particulars of British companies and foreign companies with a British address. The lists of electrical undertakings in England include the nature of the supply, system of distribution, capacity of plant, etc.

THE SECOND ANNUAL REPORT for the year 1908 of the Public Service Commission of the second district, State of New York, has been issued. This report is published in three volumes. Vol. 1 is devoted to the general report of the work of the various divisions of the commission, and the general and current inspection data issued during the period under review. Vol. 2 is devoted to a presentation of the uniform system of accounts adopted September 17, and which became effective October 1, 1908. Vol. 3 is devoted to abstracts of the reports of corporations coming under the jurisdiction of the commission. This report is voluminous and forms one of the most valuable and interesting additions to the literature of this subject which has ben published to date.

TERRESTIAL MAGNETISM.—The department of terrestial magnetism of the Carnegie Institute of Washington has issued several bulletins treating of the magnetic conditions throughout the United States. The United States Magnetic Tables and Magnetic Charts for 1905, by L. A. Bauer, is an abstract from a paper written at the close of the magnetic work of the United States Coast and Geodetes Survey, of which the author was in charge. This publication is the most complete summary thus far made of the magnetic survey in the United States and adjacent regions. "An Experimental Investigation of Dip Needle Corrections," by P. H. Dike, is a paper which was presented in part before the Philosophical Society of Washington, May 22, 1909. The investigations were made with the purpose of reducing to "standard" the shore and sea values observed by the party on board the magnetic survey yacht, "Galilee," during her cruise in the Pacific Ocean. A bulletin on the comparison of magnetic standards is the reprint of a paper by John A. Fleming and J. C. Pearson, presented before the American Association for the Advancement of Science. In the work treated in this paper, comparisons were made between the instruments of the Carnegie Institution and those of observatories in many parts of the world. The annual report of the director of the department of terrestial magnetism contains much information as to the equipment of the department, and the work which it is doing. Several illustrations of the non-magnetic ship, "Carnegie," are shown. A bulletin in explanation of the scope and organization of the institute is also being distributed.

NEW INCORPORATIONS.

SEATTLE, WASH.—The Commonwealth Power and Water Company, with a capital stock of $5,000,000 has been incorporated by J. E. Burns, E. F. Waggoner, F. W. Dewart, L. H. Brown and Carl Ultes.

ATLANTA, GA.—The Builders' Electric Company is incorporated with a capital stock of $5,000 by William T. Proctor, R. H. Hunt, Jr., and associates, to manufacture and sell all kinds of electrical apparatus and supplies. L.

ALBANY, N. Y.—The Electro-Flash Sign Company has been incorporated to manufacture and deal in electric signs, with $25,000 capital. The incorporators are: C. H. Collins, B. W. Burdick, Albany; E. S. Platt, Troy.

BROOKLYN, N. Y.—Guild & Garrison, with a capital of $100,000 has been incorporated to manufacture and deal in mechanical electrical and chemical apparatus. The incorporators are: W. R. Lynch, E. Jenkins, W. J. Gould, Brooklyn.

NEW YORK, N. Y.—The Sanitary Telephone Company has been incorporated with a capital of $400,000, to manufacture and deal in telephones and electrical apparatus. The incorporators are: John Tatlock, Appleton L. Cairk and Henry A. Crosby.

NEW YORK, N. Y.—The New York Electric Tool Company, of Manhattan, has been incorporated with a capital of $50,000 to manufacture and deal in electrical devices and appliances. The incorporators are M. S. Carver, A. F. Carver, H. C. Morris, all of New York city.

ROCKLAND, ME.—The P. & B. Manufacturing Company has been incorporated for the purpose of dealing in electric railway material and devices. The capital stock of $10,000 is all paid in. J. L. Perkins, of Springfield, Mass., is president and J. A. Perkins is treasurer.

NEW YORK, N. Y.—The American Electricity Economizing Company has been incorporated to deal in and manufacture electrical apparatus and appliances, with a capital of $100,000. The incorporators are: G. N. Ausell, C. O. Alberga, New York City; C. I. Friedman, Brooklyn.

TRENTON, N. J.—The International Telephone Supply Company has been incorporated in Trenton, N. J., with an authorized capital of $1,000,000, fully paid in. The object is to manufacture and deal in telephone and telegraph supplies. The incorporators are: John C. Burmeister, of Chicago, and William H. Agricola and Robert Manly, of New York.

BUFFALO, N. Y.—The Auto Battery and Electric Company has been incorporated with a capital stock of $20,000. The directors are:: Theodore P. Meinhard, Charles B. Bleyler, Montford Ryan, Charles H. Fisher, William C. Moore and William J. Rosenbarger, of this city; Charles and William Rosenblatt, of New York, and Charles S. Chamberlain, of Evansville, Ind.

INDUSTRIAL ITEMS.

ARTHUR JONES COMPANY, of Chicago, has moved to 223 South Clinton Street, where the company will continue to deal in electrical machinery.

THE McROY CLAY WORKS, 445 The Rookery, Chicago, Ill., manufacturers of conduits for telephone, telegraph, electric light and power cables, is distributing its March calendar-blotter to the trade.

THE AMERICAN ARC LAMP COMPANY, Kalamazoo, Mich., has been awarded a patent on its "tungsten shop cluster fixture," and on its "tungsten life saver," these patents being issued January 25. The "life saver" was approved on February 8, 1910, and the cluster on November 8, 1909.

THE BELL LUMBER COMPANY, of Minneapolis, Minn., producers of white cedar poles, has just secured an order for fifty cars of piling from the city of Minneapolis, which will be shipped at once from the company's yards at Bayfield, Wis. The company is excellently equipped to make prompt shipments of poles and ties.

THE OSHKOSH LOGGING TOOL COMPANY, Oshkosh, Wis., in a circular recently distributed, calls attention to a pin made from wood called Kalkeen, which is claimed to be the strongest and most durable wood obtainable. The company invites those interested to write for the test of this wood, conducted by the Armour Institute of Technology.

THE DUPLEX METALS COMPANY, Singer Building, New York, N. Y., has recently sent out an attractively bound set of standard specifications for hard drawn copper-clad steel wire and for copper-clad steel bond wires. These specifications state in detail the composition, inspection requirements and sizes of this wire and should prove of value to persons interested.

THE PITTSBURGH TRANSFORMER COMPANY, Pittsburg, Pa., has published a new catalogue devoted to power transformers of the oil-insulated, self-cooled type. This catalogue gives some interesting information on this apparatus, and shows a number of carefully prepared illustrations demonstrating the process of construction and indicating the merits of these transformers. Copies of this catalogue will be furnished upon request.

THE ILLINOIS APPLIANCE COMPANY, Chicago, Ill., manufacturers of the well-known Adaptable lamp changer, announces that owing to the increasing demand for these changers it was found necessary to move to more commodious quarters at 613 Crilly Building, Chicago, where the same prompt attention and courtesy will be extended to all customers. Announcement is also made that H. H. Woods has been appointed sales manager.

THE SAFETY INSULATED WIRE AND CABLE COMPANY, 114 Liberty Street, New York city, announces that it is ready through its construction department to undertake the complete installation of electrical subways. This includes the building of conduits, manholes and handholes, as well as the manufacturing, drawing in and connecting up of cables and the furnishing and placing of junction boxes, terminals and other cable accessories.

THE COLUMBIA METER COMPANY, Indianapolis, Ind., manufacturers of electric meters, is distributing a booklet describing Columbia direct-current, integrating kilowatt-hour, type D meters. In addition to several illustrations which show the mechanism of this meter, the publication contains a complete tabulated price list giving revise prices on meters of all sizes of this type. In connection with this booklet the company is also sending out an attractive post-card containing a photograph reproduction.

THE WATSON-STILLMAN COMPANY, 50 Church Street, New York, N. Y., is distributing a catalogue devoted to hyraulic valves and fittings. Almost every page contains some hint or advice as to the best piping arrangements, what types or combinations of valves are best suited to certain work, how the valves arrangement may operate a number of cylinders or machines automatically, etc. An engineer will find this book handy when figuring on new hydraulic installations or making changes on old ones.

THE ALLIS-CHALMERS COMPANY, Milwaukee, Wis., has received an order from the Chippewa Valley Railway, Light and Power Company for complete hydraulic equipment of its Red Cedar plant at Eau Claire, Wisconsin. The plant contains one 3,600 horsepower generator unit operating under forty-eight feet head and placed in a hollow dam of the Ambursen Hydraulic Construction Company's building. A complete hydraulic governor and an exciter unit, also head gates, trash racks, etc., for the plant, have also been ordered from Allis-Chalmers Company.

THE LIBERTY COW-MILKER COMPANY, Hammond, Ind., has sent out a catalogue describing their electric cow-milking machines. Several recommendations are contained in the booklet, and a number of illustrations are shown. The construction and operation of the machine are quite fully described and some hints on electricity are given for non-technical users. A booklet "Are Cow-Milkers a Success?" has also been published, with the object of convincing those interested in the dairy business that the successful abstraction of milk by machinery has been accomplished.

THE ECONOMY SWITCHBOARD AND MANUFACTURING COMPANY, Cleveland, Ohio, has appointed the Crescent Sales Company of Chicago, Ill., as selling agents for Illinois, Indiana, Minnesota and Missouri. Richard Wick, 356 Dearborn St., Chicago, has been appointed as selling agent for Wisconsin, Michigan, Pennsylvania, and Iowa. McClary Jamison, of Birmingham, Ala., has been appointed as agent for Alabama, Mississippi, Florida, and Kentucky. These agents will handle several kinds of switchboxes for all kinds of work, and a number of other electrical fittings manufactured by the Economy Company.

THE HEAVY FIRE PROOF WIRE COMPANY, York, Pa., has recently added a line of asbestos insulated and braided cords to their list of fire-proof wires. These cords are intended for moving picture machines and also for domestic use in connection with smoothing irons, toasters, etc. Under this process the cords are much neater in appearance than the cords generally used and are heat, moisture and fire-proof. The cords have been approved by the Board of Fire Underwriters and also by the city (Department of Water, Gas and Electricity). The cords are made with patent moisture-proof insulation on the conductor and have one layer of asbestos braid over the insulation and if desired the asbestos braid is saturated with their moisture-proof compound, thus giving the cord a smooth, solid appearance with great flexibility.

THE TRIUMPH ELECTRIC CO., Cincinnati, O., has prepared, for the especial attention of printers, a booklet entitled "The Printer's Guide." Coming from manufacturers who make a specialty of motors suited to this kind of drive, the information may be accepted as absolutely authoritative. Notwithstanding the technical source of the booklet, it is written in such a way as to be easily understood by everyone familiar with machinery, even though he may not have ever given time to a special investigation of electricity. The booklet warns particularly, not only against the obviously indiscreet choice of too small a motor to drive a given press, but against the selection of a motor which is too large and consequently not economical. The booklet contains several valuable tables of sizes for motors suited to various presses and to different kinds of work.

THE ELECTRIC STORAGE BATTERY COMPANY, Philadelphia, Pa., announces that Pierson, Roeding and Company, of San Francisco, Seattle and Los Angeles, Cal., have been appointed as its sole Pacific selling agents. George R. Murphy, now interested with Pierson, Roeding and Company, will represent this company in the sale of batteries on the coast. He has had ten years' experience in various departments of the organization and will devote himself exclusively to the battery business, with offices in the Crocker building, San Francisco, Cal. The Pacific Coast branches of the construction, operating and exide inspection departments will be continued, with offices at 590 Howard Street, San Francisco. Pierson, Roeding and Company will operate the exide battery depot at 590 Howard Street, San Francisco, and will carry an ample stock to insure prompt shipments.

DATES AHEAD.

Minnesota Electric Association. Annual convention, Minneapolis, Minn., March 29, 30 and 31.

Missouri Electric, Gas, Steel Railway and Water Works Association. Next convention, Jefferson City, Mo., April 14, 15 and 16.

Florida Electric Light and Power Association. Next meeting, Tampa, Fla., April 21.

Iowa Electrical Association and Iowa Street and Interurban Railway Association. Annual conventions, Sioux City, Ia., April 20 and 21.

National Electric Light Association. Annual convention, St. Louis, Mo., May 23-28.

Directory of Electrical and Allied Engineering and Scientific Societies

(Published in the second issue of each month.)

ALABAMA LIGHT AND TRACTION ASSOCIATION. Secretary, Lloyd Lyon, secretary and auditor Mobile Light and Railway Company, 158 Government Street, Mobile, Ala.

AMERICAN ASSOCIATION OF ELECTRIC MOTOR MANUFACTURERS. Secretary, W. H. Tapley, 29 West Thirty-ninth Street, New York, N. Y.

AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE. Secretary, L. O. Howard, Smithsonian Institution, Washington, D. C.

AMERICAN ELECTROCHEMICAL SOCIETY. Secretary, Dr. J. W. Richards, Bethlehem, Pa.

AMERICAN ELECTROTHERAPEUTIC ASSOCIATION. Secretary, Dr. Albert C. Geyser, 352 Willis Avenue, New York city.

AMERICAN FOUNDRYMEN'S ASSOCIATION. Secretary, Dr. Richard Moldenke, Wachtung, N. J.

AMERICAN INSTITUTE OF ELECTRICAL ENGINEERS. Secretary, Ralph W. Pope, Engineering Societies Building, 29 West Thirty-ninth Street, New York city.

AMERICAN INSTITUTE OF MINING ENGINEERS. Secretary, Rossiter W. Raymond, 29 West Thirty-ninth Street, New York city.

AMERICAN MATHEMATICAL SOCIETY. Secretary, F. N. Cole, 50 West One Hundred and Sixteenth Street, New York city.

AMERICAN RAILWAY MASTER MECHANICS' ASSOCIATION. Secretary, J. W. Taylor, Old Colony Building, Chicago, Ill.

AMERICAN ROENTGEN-RAY SOCIETY. Secretary, Dr. G. C. Johnson, 514 Bijou Building, Pittsburg, Pa.

AMERICAN SOCIETY FOR TESTING MATERIALS. Secretary, Prof. Edgar Marburg, University of Pennsylvania, Philadelphia, Pa.

AMERICAN SOCIETY OF MECHANICAL ENGINEERS. Secretary, Calvin W. Rice, 29 West Thirty-ninth Street, New York city.

AMERICAN SOCIETY OF CIVIL ENGINEERS. Secretary, Charles Warren Hunt, 220 West Forty-seventh Street, New York city.

AMERICAN SOCIETY OF MUNICIPAL IMPROVEMENTS. Secretary, A. P. Folwell, Flatiron Building, New York city.

AMERICAN STREET AND INTERURBAN RAILWAY ASSOCIATION. Secretary, B. V. Swenson, Engineering Societies Building, 29 West Thirty-ninth Street, New York city.

AMERICAN STREET AND INTERURBAN RAILWAY ACCOUNTANTS' ASSOCIATION. Secretary, H. E. Weeks, secretary and treasurer Tri-City Railway Company, Davenport, Iowa.

AMERICAN STREET AND INTERURBAN RAILWAY CLAIM AGENTS' ASSOCIATION. Secretary, B. B. Davis, claim agent Columbus Railway and Light Company, Columbus, Ohio.

AMERICAN STREET AND INTERURBAN RAILWAY ENGINEERING ASSOCIATION. Secretary, J. W. Corning, electrical engineer Boston Elevated Railway Company, Boston, Mass.

AMERICAN STREET AND INTERURBAN RAILWAY TRANSPORTATION AND TRAFFIC ASSOCIATION. Secretary, B. V. Swenson, Engineering Societies Building, 29 West Thirty-ninth Street, New York city.

AMERICAN STREET AND INTERURBAN RAILWAY MANUFACTURERS' ASSOCIATION. Secretary, George B. Keegan, 2321 Park Row Building, New York city.

ARKANSAS ASSOCIATION OF PUBLIC UTILITY OPERATORS. Secretary, J. E. Cowles, superintendent of Lighting, Hot Springs Light and Railway Company, Hot Springs, Ark.

ARKANSAS INDEPENDENT TELEPHONE ASSOCIATION. Secretary, Charles F. Speed, Texarkana, Ark.

ASSOCIATION OF EDISON ILLUMINATING COMPANIES. Secretary, N. T. Wilcox, Lowell, Mass.

ASSOCIATION OF EDISON PURCHASING AGENTS. Secretary, H. F. Frasse, Edison Electric Illuminating Company, Brooklyn, N. Y.

ASSOCIATION OF ELECTRIC LIGHTING ENGINEERS OF NEW ENGLAND. Secretary, W. H. Cole, Waltham, Mass.

ASSOCIATION OF IRON AND STEEL ELECTRICAL ENGINEERS. Secretary, G. H. Winslow, Perry-Payne Building, Cleveland, O.

ASSOCIATION OF RAILWAY ELECTRICAL ENGINEERS. Secretary, G. B. Colegrove, Illinois Central Railroad, Chicago, Ill.

ASSOCIATION OF RAILWAY TELEGRAPH SUPERINTENDENTS. Secretary, P. W. Drew, Minnesota, St. Paul & Sault Ste. Marie Railroad, Chicago, Ill.

CALIFORNIA ELECTRIC RAILWAY ASSOCIATION. Secretary, L. E. W. Pioda, Oak and Broderick Streets, San Francisco, Cal.

CALIFORNIA INDEPENDENT TELEPHONE ASSOCIATION. Secretary, P. T. Whittier, Spencer, Cal.

CANADIAN ELECTRICAL ASSOCIATION. Secretary, T. S. Young, Confederation Life Building, Toronto, Canada.

CANADIAN STREET RAILWAY ASSOCIATION. Secretary, Acton Burrows, 157 Bay Street, Toronto, Ontario.

CENTRAL ELECTRIC RAILWAY ASSOCIATION. Secretary, A. L. Neereamer, Traction Terminal Building, Indianapolis, Ind.

CENTRAL ELECTRIC TRAFFIC ASSOCIATION. Secretary, J. T. Brittson, assistant claim agent Chicago, South Bend & Northern Indiana Railway Company, South Bend, Ind.

COLORADO ELECTRIC LIGHT, POWER AND RAILWAY ASSOCIATION. Secretary, J. C. Lawler, Colorado Springs, Colo.

CONNECTICUT STATE STREET RAILWAY ASSOCIATION. Secretary, F. W. Poole, Bridgeport, Conn.

ELECTRIC CLUB OF CHICAGO. Secretary, F. S. Hickok, Marquette Building, Chicago, Ill.

ELECTRIC CLUB OF CLEVELAND. Secretary, George L. Crosby, 1200 Schofield Building, Cleveland, Ohio.

ELECTRICAL CLUB OF CALIFORNIA. Secretary, Russell D. Holabird, Argonaut Hotel, San Francisco, Cal.

ELECTRICAL CONTRACTORS' ASSOCIATION OF NEW YORK STATE. Secretary, George William Russell, Jr., 25 West Forty-second Street, New York city.

ELECTRICAL CONTRACTORS' ASSOCIATION OF STATE OF MISSOURI. Secretary, Charles J. Sutter, 1220 Pine Street, St. Louis, Mo.

ELECTRICAL TRADES ASSOCIATION OF CANADA, LIMITED. Secretary, William R. Staveley, Royal Insurance Building, Montreal, Canada.

ELECTRICAL TRADES ASSOCIATION OF CHICAGO. Secretary, Frederic P. Vose, 1343 Marquette Building, Chicago, Ill.

ELECTRICAL TRADES ASSOCIATION OF PHILADEPHIA. Secretary, John W. Crum, 1324 Land Title Building, Philadelphia, Pa.

ELECTRICAL TRADES ASSOCIATION OF THE PACIFIC COAST. Secretary, Albert H. Elliott, Harding Building, San Francisco, Cal.

ELECTRICAL TRADES SOCIETY OF NEW YORK. (Member National Electrical Trades Association.) Secretary, Franz Neilson, 80 Wall Street, New York city.

EMPIRE STATE GAS AND ELECTRIC ASSOCIATION. Secretary, Charles H. B. Chapin, 29 West Thirty-ninth Street, New York city.

ENGINE BUILDERS' ASSOCIATION OF THE UNITED STATES. Secretary, J. I. Lyle, 39 Cortlandt Street, New York city.

ENGINEERS' CLUB OF PHILADELPHIA. Secretary, H. G. Perring, 1317 Spruce Street, Philadelphia, Pa.

ENGINEERS' SOCIETY OF MILWAUKEE. Secretary, W. Fay Martin, Milwaukee, Wis.

FLORIDA ELECTRIC LIGHT AND POWER ASSOCIATION. Secretary, G. F. Doig, Gainesville, Fla.

ILLINOIS INDEPENDENT TELEPHONE ASSOCIATION. Secretary, C. A. Camp, Henry, Ill.

ILLINOIS STATE ELECTRIC ASSOCIATION. Secretary, H. E. Chubbuck, Mayer Building, Peoria, Ill.

ILLUMINATING ENGINEERING SOCIETY. Secretary, Preston S. Millar, Engineering Societies Building, 33 West Thirty-ninth Street, New York city.

INDEPENDENT TELEPHONE ASSOCIATION OF TEXAS AND LOUISIANA. Secretary, C. A. Shock, Sherman, Tex.

INDIANA ELECTRIC LIGHT ASSOCIATION. President and acting secretary, C. C. Perry, Indianapolis Light and Heat Company.

INDIANA INDEPENDENT TELEPHONE ASSOCIATION. Secretary, Allan J. Paylow, Rockport, Ind.

INTERNATIONAL ASSOCIATION OF MUNICIPAL ELECTRICIANS. Secretary, Frank P. Foster, Corning, N. Y.

IOWA ELECTRICAL ASSOCIATION. Secretary, W. N. Keiser, Des Moines, Iowa.

IOWA INDEPENDENT TELEPHONE ASSOCIATION. Secretry, W. J. Thill, Des Moines, Iowa.

IOWA STREET AND INTERURBAN RAILWAY ASSOCIATION. Secretary, L. D. Mathes, Dubuque, Iowa.

KANSAS GAS, WATER, ELECTRIC LIGHT AND STREET RAILWAY ASSOCIATION. Secretary, James D. Nicholson, Newton, Kan.

KENTUCKY INDEPENDENT TELEPHONE ASSOCIATION. Secretary, W. G. Turpine, Henderson, Ky.

MAINE ELECTRIC ASSOCIATION. Secretary, F. D. Gordon, Auburn, Me.

MAINE INDEPENDENT TELEPHONE ASSOCIATION. Secretary, M. E. Crow, Houlton, Me.

MAINE STREET RAILWAY ASSOCIATION. Secretary, E. A. Newman, 471 Congress Street, Portland, Me.

MASSACHUSETTS STREET RAILWAY ASSOCIATION. Secretary, Charles S. Clark, 70 Kilby Street, Boston, Mass.

MASTER CAR BUILDERS' ASSOCIATION. Secretary, J. W. Taylor, 390 Old Colony Building, Chicago, Ill.

MICHIGAN ELECTRIC ASSOCIATION. Secretary and treasurer, A. P. Biggs, Detroit, Mich.

MICHIGAN INDEPENDENT TELEPHONE ASSOCIATION. Secretary, A. A. Burch, Battle Creek, Mich.

MINNESOTA ELECTRICAL ASSOCIATION. Secretary-treasurer, B. W. Copperthwait, Faribault, Minn.

MISSISSIPPI ELECTRICAL ASSOCIATION. Secretary, J. Abott, Manager Jackson Electric Railway, Light and Power Company, Jackson, Miss.

MISSOURI ELECTRIC, GAS, STREET RAILWAY AND WATERWORKS ASSOCIATION. Secretary, Claude L. Clary, Sikeston Electric Light and Power Company, Sikeston, Mo.

MISSOURI INDEPENDENT TELEPHONE ASSOCIATION. Secretary, George W. Schwerer, Windsor, Mo.

MUNICIPAL LIGHTING ASSOCIATION OF MASSACHUSETTS. Secretary, J. C. Norcross, Reading, Mass.

NATIONAL ARM, PIN AND BRACKET ASSOCIATION. Secretary, J. B. Magers, Madison, Ind.

NATIONAL DISTRICT HEATING ASSOCIATION. Secretary, D. L. Gaskill, Greenville, O.

NATIONAL ELECTRICAL CONTRACTORS' ASSOCIATION OF THE UNITED STATES. Secretary, W. H. Morton, 41 Martin Building, Utica, N. Y.

NATIONAL ELECTRICAL TRADES ASSOCIATION. Secretary, Frederic P. Vose, 1343 Marquette Building, Chicago, Ill.

NATIONAL ELECTRIC LIGHT ASSOCIATION. Secretary and treasurer, F. M. Tait, 124 East Fourth Street, Dayton, Ohio. Executive secretary, T. C. Martin, 33 West Thirty-ninth Street, New York City.

NATIONAL INDEPENDENT TELEPHONE ASSOCIATION. Secretary, J. B. Ware, Monadnock Block, Chicago, Ill.

NEBRASKA ELECTRICAL ASSOCIATION. Secretary, Frank McMaster, Beatrice, Neb.

NEBRASKA INDEPENDENT TELEPHONE ASSOCIATION. Secretary, R. E. Mattison, Lincoln, Neb.

NEW ENGLAND ELECTRICAL TRADES ASSOCIATION. Secretary, Alton F. Tupper, 84 State Street, Boston, Mass.

NEW ENGLAND SECTION, NATIONAL ELECTRIC LIGHT ASSOCIATION. Secretary, C. H. Hodskinson, Boston, Mass.

NEW ENGLAND STREET RAILWAY CLUB. Secretary, John J. Lane, 12 Pearl Street, Boston, Mass.

NEW YORK ELECTRICAL SOCIETY. Secretary, G. H. Guy, Engineering Societies Building, 29 West Thirty-ninth Street, New York city.

NEW YORK RAILROAD CLUB. Secretary, H. D. Vote, 95 Liberty Street, New York, N. Y.

NEW YORK STATE INDEPENDENT TELEPHONE ASSOCIATION. Secretary, R. Max Eaton, Niagara Falls, N. Y.

NORTHWEST ELECTRIC LIGHT AND POWER ASSOCIATION. Secretary, N. W. Brockett, Cataract Building, Seattle, Wash.

OHIO ELECTRIC LIGHT ASSOCIATION. Secretary, D. L. Gas-Kill, Greenville, Ohio.

OHIO INDEPENDENT TELEPHONE ASSOCIATION. Secretary, Ralph Reamer, Columbus, Ohio.

OHIO SOCIETY OF MECHANICAL, ELECTRICAL AND STEAM ENGINEERS. Secretary, Prof. F. E. Sanborn, Ohio State University, Columbus, Ohio.

OHIO STREET RAILWAY ASSOCIATION. Secretary, Charles Currie, Akron, Ohio.

OKLAHOMA ELECTRIC LIGHT, RAILWAY AND GAS ASSOCIATION. Secretary, Galen Crow, Guthrie, Okla.

OLD-TIME TELEGRAPHERS' AND HISTORICAL ASSOCIATION. Secretary, Frank J. Scherrer, 195 Broadway, New York city.

ORDER OF THE REJUVENATED SONS OF JOVE. Mercury, Roy M. Van Vliet, Monandock Block, Chicago, Ill.

PACIFIC COAST ELECTRIC TRANSMISSION ASSOCIATION. Secretary, Samuel G. Reed, Portland, Ore.

PENNSYLVANIA ELECTRIC ASSOCIATION. Secretary, Van Dusen Rickert, Pottsville, Pa.

PENNSYLVANIA STATE INDEPENDENT TELEPHONE ASSOCIATION. Secretary, H. . Bradley, 135 South Second Street, Philadelphia, Pa.

PENNSYLVANIA STATE STREET RAILWAY ASSOCIATION. Secrtary, Charles H. Smith, Lebanon, Pa.

PIKE'S PEAK POLYTECHNIC SOCIETY. Secretary, E. A. Sawyer, Colorado Springs, Colo.

RAILWAY SIGNAL ASSOCIATION. Secretary, C. C. Rosenberg, Bethlehem, Pa.

SOCIETY OF AUTOMOBILE ENGINEERS. Secretary, Alexander Churchward, 30 Church Street, New York city.

SOCIETY OF WIRELESS TELEGRAPH ENGINEERS. Secretary, E. D. Forbes, 96 Franklin Street, South Framingham, Mass.

SOCIETY FOR THE PROMOTION OF ENGINEERING EDUCATION. H. H. Norris, Cornell University, Ithaca, N. Y.

SOUTH DAKOTA INDEPENDENT TELEPHONE ASSOCIATION. Secretary-treasurer, E. R. Buck, Hudson, S. D.

SOUTHWESTERN ELECTRICAL AND GAS ASSOCIATION. Secretary, E. T. Moore, Dallas, Tex.

STREET RAILWAY ASSOCIATION OF THE STATE OF NEW YORK. Secretary, J. H. Pardee, J. G. White & Company, New York city.

TEXAS INDEPENDENT TELEPHONE ASSOCIATION. Secretary, T. A. Gould, Ennis, Tex.

UNDERWRITERS' NATIONAL ELECTRIC ASSOCIATION. Secretary Electrical Committee, C. M. Goddard, 141 Milk Street, Boston, Mass.

VERMONT AND NEW HAMPSHIRE INDEPENDENT TELEPHONE ASSOCIATION. Secretary-treasurer, E. B. Seeley, St. Johnsbury, Vt.

VERMONT ELECTRICAL ASSOCIATION. Secretary, A. B. Marsden, Manchester, Vt.

VIRGINIA STATE INDEPENDENT TELEPHONE ASSOCIATION. Secretary, B. L. Fisher, Rocky Mount, Va.

WESTERN SOCIETY OF ENGINEERS. Secretary, J. H. Warder, Monadnock Block, Chicago, Ill.

WISCONSIN ELECTRICAL ASSOCIATION. Secretary, John S. Allen, Lake Geneva, Wis.

WISCONSIN INDEPENDENT TELEPHONE ASSOCIATION. Secretary, J. C. Crowley, Jr., Superior, Wis.

RECORD OF ELECTRICAL PATENTS.

Issued (United States Patent Office) March 1, 1910.

950,473. TELEGRAPH BULLETIN-PRINTER. George L. Campbell and Harry G. Davis, Williamsport, Pa., assignors to Electric Press Bulletin Company, Williamsport, Pa. Filed Nov. 11, 1908. The selector contacts are electrically connected with the contacts of a sunflower controller, etc.

950,502. OUTLET-BOX. Albert I. Appleton, Chicago, Ill., and Otto C. Hoffmann, Buffalo, N. Y., assignors to Chicago Fuse Wire & Manufacturing Company, Chicago, Ill. Filed Nov. 29, 1905. The box is provided with brackets each having two integral portions one turned in an angle to the other, and means for securing either of the two portions of a bracket to a side wall of the box.

950,513. ELECTRICAL MEASURING INSTRUMENT. Edwin F. Northrup, Philadelphia, Pa., assignor to Leeds and Northrup Company. Filed Dec. 7, 1908. In combination with circuit branches, having an adjustable resistance common to the branches, is a resistance in a branch changing nonuniformly with respect to a quantity to be measured; a uniform scale is associated with the adjustable resistance, the latter being made nonuniform in resistance with respect to its length for compensating for the nonuniform change in resistance of the branch resistance.

950,520. ELECTRIC WINDING MECHANISM FOR TIMEPIECES. Jacob Steiger, Besancon, France, and James Besancon, La Chaux-de-Fonds, Switzerland. Filed May 12, 1909. The motor circuit is closed by a pair of contact members, one of which is engaged by a collet which permits it to descend by gravity at a predetermined time; a second collet acts on the other contact member to raise it into contact with the companion member.

950,548. AUTOMATIC THERMOSTAT-ADJUSTER. Joseph W. Frost, Washington, D. C. Filed Dec. 4, 1908. A screwdriver is controlled by an electric motor.

950,555. ELECTRICAL RECORDER. Edwin F. Northrup, Philadelphia, Pa., assignor to Leeds and Northrup Company. Filed Feb. 16, 1909. A member carried by the moving system of a galvanometer is engaged by a periodically operating member to control a circuit which in turn controls a step-by-step recording mechanism.

950,599. ELECTRIC HEATER. Min Delin McGerry, Grand Rapids, Mich., assignor to Bert E. McDonald, Chicago, Ill. Filed Mar. 4, 1908. The heater comprises two air conduits, one extending within the other and spaced therefrom; an electric heating coil wound about the inner conduit, insulated therefrom and exteriorly exposed within the outer conduit, the inner conduit being of metal and having a multiplicity of inwardly-extending heat-radiating tapered fingers or bosses distributed throughout the length as well as the breadth of the conduit, obstructing the air path through the inner conduit.

950,620. ELECTRIC CURLING-IRON HEATER. Cathorine P. Harmon, Evanston, Ill. Filed Sept. 30, 1909. The heating coil is contained in an oblate spheroidal shell in which are different-sized obliquely disposed tubes for the reception of curling-iron blades.

950,623. ELECTRIC SIGNAL FOR RAILWAYS. Willard Kirkpatrick and Frank W. Van Tuyl, Kansas City, Kans. Filed Nov. 16, 1908. A car traveling on the trackway is provided with means for successively effecting the engagement of yieldingly-separated contacts.

950,630. TROLLEY-POLE. Henry Brod, St. Charles, Mo. Filed May 24, 1909. Describes a form of bow trolley.

950,647. ELECTRICAL MEASURING INSTRUMENT. Maurice J. Wohl, New York, and Harry Hertzberg, Brooklyn, N. Y., assignors to Abbot A. Low, Horseshoe, N. Y., Maurice J. Wohl, New York, N. Y., and Harry Hertzberg, Brooklyn, N. Y., trustees. Filed Mar. 20, 1908. Comprises a movable indicator, a pivoted operating member adapted to have operative connection with this indicator when moved in one direction only, means adapted to move the member in this direction, supports positioned on opposite sides of the pivot of the operating member, a pair of thermal wires under tension connected to these supports and to the pivoted member at points on opposite sides of the axis thereof, said wires being arranged and adapted to expand or contract simultaneously under thermal action, and means whereby the wires are simultaneously heated electrically.

950,650. CLUSTER LAMP-SOCKET. Reuben B. Benjamin, Chicago, Ill., assignor to Benjamin Electric Manufacturing Company, Chicago, Ill. Filed Feb. 8, 1908. Comprises a sleeve having an inwardly extending portion, an electrically contacting lamp-holding shell disposed within this sleeve and having an inwardly extending portion, and an insulating lining interposed between the shell and the sleeve and having an inwardly extending portion clamped between the inwardly extending portions of this sleeve and shell respectively.

950,651. LAMP-HOLDING DEVICE. Reuben B. Benjamin, Chicago, Ill., assignor to Benjamin Electric Manufacturing Company, Chicago, Ill. Filed Mar. 13, 1908. Describes a form of cluster socket.

950,652. CLUSTER LAMP-SOCKET. Reuben B. Benjamin, Chicago, Ill., assignor to Benjamin Electric Manufacturing Company, Chicago, Ill. Filed Apr. 14, 1908. Comprises a supporting cap, a base insertible into the cap and supported thereby, binding terminals carried by the base, a lamp-engaging contact also carried by the base, a ring-shaped insulating base arranged to extend around the cap, means for detachably securing the ring-shaped base to the cap, and a lamp-holder carried by the ring-shaped base and arranged to support a lamp in position to engage the contact.

950,714. ELECTRICAL TESTING APPARATUS. Henry J. Blakeslee, Syracuse, N. Y. Filed Feb. 23, 1909. A transformer has a handle of electric-conducting material connected across a portion of its secondary winding.

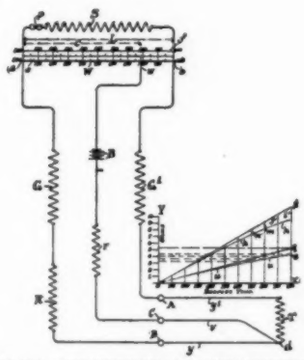
950,716. PROCESS OF BONDING RAILS. Charles L. Cadle, Cleveland, Ohio, assignor to The Electric Railway Improvement Company, Cleveland, Ohio. Filed Jan. 2, 1907. Renewed Oct. 21, 1908. The process consists in first soldering or brazing the bodies together, and then raising the same to substantially a welding temperature by means of a voltaic arc.

950,718. LIFTING-MAGNET. Arthur C. Eastwood, Cleveland, Ohio. Filed Feb. 15, 1906. A nonmagnetic plate covers the coil on the active side of the magnet, a second nonmagnetic plate prevents wear of the first plate, and elastic packing is included between the plates.

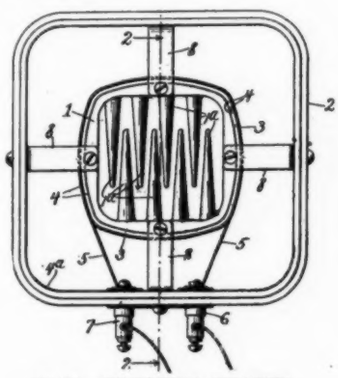
950,737. ELECTRIC PUMP-GOVERNOR. Walter V. Turner, Edgewood, Pa., assignor to The Westinghouse Air Brake Company, Pittsburg, Pa. Filed May 15, 1907. A pressure governor comprises a controlling device and actuating piston, a valve mechanism operated by pump pressure to admit fluid to the actuating piston, and means governed by the piston for also supplying fluid to operate the piston.

950,760. ELECTRIC MERCURY ARC-LAMP. John M. Anck, Philadelphia, Pa.; William Anck, administrator of said John M. Anck, deceased, assignor of one-twelfth to John A. Wiedersheim, one-twelfth to William Caner Wiedersheim, one-twelfth to E. Hayward Fairbanks, and one-fourth to William Steell Jackson, Philadelphia, Pa. Filed May 13, 1904. An electric heater is provided to boil and vaporize the mercury to cause contact with the arcing electrode above the mercury.

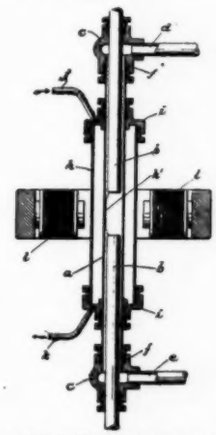
950,777. METHOD OF PLATING TUBES, ETC. William H. Winslow, Chicago, Ill. Filed Feb. 6, 1908. The method of plating tubes, etc., consists in sand-blasting the tubes, immediately dipping the tubes in a weak copper-sulphate solution, copper-plating the tubes electrically in an alkaline plating solution, copper-plating the tubes electrically in an acid-plating solution, cleaning the copper surface by means of solder flux, and then dipping the tubes in a hot solder bath.



950,513.—ELECTRICAL MEASURING INSTRUMENT.



950,599.—ELECTRIC HEATER.



950,703.—NITROGEN GAS APPARATUS.

950,688. APPARATUS FOR BONDING RAILS. Charles L. Cadle, Cleveland, Ohio, assignor to The Electric Railway Improvement Company, Cleveland, Ohio. Filed Jan. 2, 1907. Describes an electric rail-bonding device.

950,703. APPARATUS FOR PRODUCING OXIDES OF NITROGEN FROM THE AIR. Francis I. du Pont, Wilmington, Del., assignor to The E. I. du Pont de Nemours Powder Company, Wilmington, Del. Filed Apr. 17, 1909. The apparatus comprises a surface which is a non-conductor of electricity, in contact with which the air to be acted on is adapted to pass, electrodes between which an arc, longitudinally with respect to which said surface, is adapted to pass, and a rotary magnetic field adjacent to the arc space, the magnetic field being of strength sufficient to deflect the arc against the surface.

950,706. CURRENT DISTRIBUTER AND TIMER. James M. Smith, Philadelphia, Pa., assignor of one-half to Wilson D. Craig Wright, Philadelphia, Pa. Filed Jan. 13, 1909. Describes the spark coil, make-and-break device, and associated igniting-timing devices, for an internal-combustion engine.

950,709. STARTING DEVICE FOR ADJUSTABLE VAPOR APPARATUS. Percy H. Thomas, East Orange, N. J., assignor to Cooper Hewitt Electric Company, New York, N. Y. Filed Apr. 12, 1904. A vacuum electric apparatus includes an exhausted container, electrodes therefor, including a cathode, supporting means adapted to permit the movement of the container into and to support the container in vertical, horizontal and intermediate positions, and a supplementary anode adapted to cooperate with the cathode in all of these positions.

950,713. PLURAL LAMP-SOCKET. Reuben B. Benjamin, Chicago, Ill., assignor to Benjamin Electric Manufacturing Company, Chicago, Ill. Original application filed Oct. 17, 1904. Divided and this application filed Oct. 1, 1907. Describes a multiple socket for electric lamps.

950,781. DETECTOR FOR WIRELESS COMMUNICATION. John L. Hogan, Jr., New York, N. Y. Filed Dec. 18, 1909. A detector for electrical oscillations consists of a piece of ferro-silicon in contact with two other conductors.

950,799. TELEPHONE APPARATUS. David H. Wilson, Chicago, Ill., assignor to George W. Kretzinger, Chicago, Ill. Filed Dec. 8, 1902. A telephone apparatus comprises an induction coil provided with a coil conductor divided into sections, a telephone transmitter connected in circuit between the sections, and a telephone receiver associated with each end of the core of the coil.

950,809. TELEPHONE DESK-SET. Burton W. Sweet Cleveland, Ohio, assignor to Harry Z. Sands, Cleveland, Ohio. Filed Apr. 1, 1907. A telephone desk-set is equipped with two removable nontelescoping casing-sections, separable in a horizontal plane, a central supporting-plate, and means for removably retaining them individually in place thereabout.

950,842. MONOPOLAR VACUUM-TUBE. Frank A. Davis, Boston, Mass. Filed Mar. 15, 1909. The vacuum tube has at one end a head of a size to permit it to be inserted into a cavity of the body and having a narrower portion communicating with this head; a conductor in this narrower portion terminates out of contact with the end of the head and a target within the head is inclined with relation to the conductor.

950,845. ELECTRICAL-BATTERY HOLDER. Henry Engel, Holyoke, Mass. Filed Mar. 10, 1909. Describes a stand for holding a number of batteries side by side.

950,847. SPARK-PLUG. Samuel B. Fowler, La Fayette, Ind. Filed

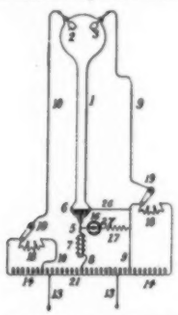
Apr. 21, 1909. The inner electrode has its end of greater diameter than its body portion whereby a spark gap is secured of less length than the thickness of the insulating material between the body portions of the two electrodes.

950,853. BURGLAR AND FIRE ALARM. Barthelemy Kohlen, Brussels, Belgium. Filed Oct. 7, 1907. In combination with an electric circuit comprising a source of energy and branches, are counteracting electromagnetic devices arranged one in each branch, an armature normally held in a state of equilibrium by these devices, a signal mechanism controlled by the armature, resistance devices, one in each branch, normally balancing each other, and means operative to cut one of the resistance devices out of circuit.

950,861. ELECTRIC BATTERY. William Morrison, Chicago, Ill. Filed Aug. 11, 1902, Serial No. 119,205. Renewed July 26, 1909. The electrilyte contains depositable bromine.

950,865. TELEPHONE-MUFFLER. William D. Plumb, New York, N. Y. Filed Jan. 19, 1910. The muffler comprises a ring plate having a central opening therein and having a damper ring on the inner side thereof, means for securing the ring plate to the mouthpiece of a transmitter with the damper ring seating on the lip of the mouthpiece, and a cover jointed to the ring plate and having a damper disk on the inner face thereof adapted to close the opening, and screening the transmitter diaphragm from the vibrations of the cover.

950,869. PROCESS OF PRODUCING AN AMORPHOUS TUNGSTEN POWDER. Johannes Schilling, Colonie Grunewald, near Berlin, Germany. Filed Mar. 23, 1909. In a process of making metallic tungsten filaments for incandescent electric lamps, a fine amorphous tungsten powder is produced by heating a tungsten compound adapted to be dissociated by heat in a non-oxidizing atmosphere to a temperature slightly above the disruption temperature, separating thereby reducing agents from the dissociating compound and allowing same to act on the oxide of tungsten abtained by the dissociation.



951,085.—SINGLE-PHASE GAS OR VAPOR ELECTRIC DEVICE.

950,877. ELECTRIC FURNACE. John Thomson, New York, N. Y., assignor to Imbert Process Company, New York, N. Y. Filed May 13, 1909. The electric furnace is provided with a resister of a constant length having a plurality of elements and means for preserving a substantially constant contact resistivity between the elements irrespective of expansion or contraction due to thermal changes.

950,878. FURNACE. John Thomson, New York, and Francis A. J. Fitz Gerald, Niagara Falls, N. Y., assignors to Imbert Process Company of New York, N. Y. Filed May 13, 1909. A revolving electric furnace has a carbon resister as a central core.

950,879. ELECTRIC FURNACE. John Thomson, New York, N. Y., assignor to Imbert Process Company, New York, N. Y. Filed September 1, 1909. A resister for an electric furnace comprises a plurality of interlocking resistance elements.

950,880. ELECTRIC FURNACE. John Thomson, New York, N. Y., assignor to Imbert Process Company, New York, N. Y. Filed September 1, 1909. A revoluble electric furnace has a resister composed of interlocked members.

950,881. ELECTRIC FURNACE. John Thomson, New York, N. Y., assignor to Imbert Process Company, New York, N. Y. Filed September 1, 1909. An electric furnace has a self-supporting resister composed of a plurality of irregular blocks arranged in the form of a flat arch.

950,882. ELECTRIC FURNACE. John Thomson, New York, N. Y., assignor to Imbert Process Company, New York, N. Y. Filed September 1, 1909. A resister for an electric furnace comprises a plurality of blocks with their faces normally only partially in contact and so constructed and arranged that upon deformation under heat the area of contact between the blocks will increase.

950,896. TELEPHONE SYSTEM. William W. Dean, Chicago, Ill., assignor to Consolidated Fire Alarm Company, New York, N. Y. Filed October 11, 1900. Includes means for applying synchronizing current to the lines at stated intervals, devices located upon the lines adapted to be synchronized by such current, and further means for preventing the application of synchronizing current to the lines while they are busy.

950,899. PLUG FOR ELECTRICAL CONNECTIONS. Augustus N. Dods, Mount Vernon, N. Y. Filed March 11, 1909. A plug for electrical connections comprises a handle, a plug of insulating material for engaging the handle, contact members mounted on the plug and insulated from each other, a collar encircling a portion of the handle and provided with a thread, and a shield provided with a thread mating the thread of the collar, the shield being further provided with a portion for engaging the plug of insulating material.

950,905. METHOD OF PROTECTING RESISTERS OF ELECTRIC FURNACES. Francis A. J. Fitz Gerald, Niagara Falls, N. Y., assignor to Imbert Process Company, New York, N. Y. Filed September 1, 1909. The method of protecting the resister of an electric furnace from oxidizing or other active gases consists in introducing an inert gas into the melting chamber and around the resister.

950,911. INDUCTION-FURNACE. Paul Gredt, Luxemburg, Luxemburg. Filed August 31, 1906. Has an annular hearth, chutes or channels attached thereto, rotary worms for introducing the necessary additions into the bath contained in the chutes, and a heating jacket surrounding the chutes or channels.

950,932. ELECTRIC FUSE. William J. Lehmann, Indianapolis, Ind. Filed July 20, 1908. An electrical fuse includes a fuse block formed of nonfusible material having a recess in the side thereof, fusible material extending through the fuse block and recess, means for passing the current through the fusible material, whereby when the material is fused the portion in the recess will flow out and break the circuit.

950,937. DISINFECTANT DEVICE FOR TELEPHONES. Arthur W. Lyda, New Castle, Pa., and Elmer C. Robinson, Lowellville, Ohio. Filed March 19, 1909. A disinfectant holder is supported in front of the mouthpiece.

950,979. PROCESS FOR PRODUCING TRANSPARENT, FLEXIBLE AND INFUSIBLE INSULATING MEANS. Kaspar Winkler, Zurich, Switzerland. Filed November 16, 1908. The process consists in heating with a suitable siccative a mixture of animal fat and a resinous compound until a transparent and insulating material is produced.

951,085. SINGLE-PHASE GAS OR VAPOR ELECTRIC DEVICE. Percy H. Thomas, Pittsburg, Pa., assignor to Cooper-Hewitt Electric Company. Original application filed June 13, 1903. Divided and this application filed August 11, 1903. A system of electrical distribution includes a gas or vapor-electric apparatus, means for creating within the same a critical strain, means for storing electrical energy in the system, means for discharging a portion of the energy through the apparatus, and means for creating a momentary initial excess of potential above the normal in the apparatus.

951,086. ELECTRIC FURNACE. John Thomson, New York, N. Y., and Francis A. J. Fitz Gerald, Niagara Falls, N. Y., assignors to Imbert Process Company, New York, N. Y. Filed May 13, 1909. An electric furnace has beveled terminals and a plurality of rods stacked between the terminals constituting the resister.

PATENTS THAT HAVE EXPIRED.

Following is a list of electrical patents (issued by the United States Patent Office) that expired March 7, 1910.

492,789. SPEAKING TELEGRAPH. Thomas A. Edison, Menlo Park, N. J.

492,792. BURGLAR ALARM. Jacob Ganzfried, New York, N. Y.

492,807. AUTOMATIC CIRCUIT BREAKER. Delos Irish and John G. Williams, Salt Lake City, Utah.

492,809. INCANDESCENT LAMP. John von ded Kammer, Chicago, Ill.

492,815. ELECTRIC ARC LAMP. Carl K. MacFadden, Chicago, Ill.

492,850. COMBINED INDICATING ELECTRIC SWITCH AND CURRENT REVERSER. Almon B. Strowger and Walter S. Strowger, Chicago, Ill.

492,866. AUTOMATIC ELECTRIC SPRINKLER AND ALARM. Chas. S. Hurd, Cleveland, Ohio.

492,881. LEADING PIECE FOR OVERHEAD ELECTRIC RAILWAYS. Henry D. Winton, Wellesley, Mass.

492,883. TELEPHONE TRANSMITTER. Chas. T. Bloomer, New York City.

492,913 ELECTRIC LAMP LIGHTER. Josephus C. Chambers, Detroit, Mich.

492,961. GAME APPARATUS. Sidney N. Johnson, Chicago, Ill.

492,971. ELECTRIC PROGRAM CLOCK. Andrew J. Beams, Wichita, Kans.

493,000. ELECTRIC STEERING GEAR. Lewis S. Van Duzer, U. S. Navy.

493,007. SECONDARY BATTERY ELECTRODE. Isaac H. Bartholomew, Northford, Conn.

493,025. ARMATURE FOR ELECTRIC MOTORS. Robert H. Hassler, Dayton, Ohio.

493,067. HOTEL TIME ANNUNCIATOR. Franklin S. Carter, Burlington, N. J.

493,069. TRUCK FOR ELECTRIC LOCOMOTIVES. John C. Henry, New York, N. Y.

493,104. DYNAMO ELECTRIC MACHINE. Wm. M. Mordey, London, England.

493,125. ELECTRICAL RAILROAD DANGER SIGNAL AND BELL. Paul Seikler, San Francisco, Calif.